Operation and Installation Manual for

Single-phase inverters with transformer, with DC isolating switch

SOL2.0-1TR1-G4
SOL2.5-1TR1-G4
SOL3.0-1TR1-G4
SOL3.3-1TR1-G4
SOL3.6-1TR1-G4
SOL5.0-1TR1-G4

This manual applies for solar power inverters with the model ID:

- **SOL2.0-1TR1-G4**
- **SOL2.5-1TR1-G4**
- **SOL3.0-1TR1-G4**
- **SOL3.3-1TR1-G4**
- **SOL3.6-1TR1-G4**
- **SOL5.0-1TR1-G4**

This manual can be amended at any time.

The latest version of this manual is available at www.solar-inverter.com.

Delta Energy Systems (Germany) GmbH

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This manual is included with our solar power inverter and is intended for use by the installer and end user.

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All information and specifications can be modified without prior notice.

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1. About This Manual

This manual will help you become familiar with the solar power inverter.

Observe the safety regulations applicable for each country. You can help keep the product durable and reliable during its use by handling it carefully. These are the basic requirements for optimal use of the solar power inverter.

1.1 Purpose of This Manual

This manual is part of the product. Store the manual in a safe place.

Read the manual carefully and thoroughly and follow the instructions contained therein. This manual contains important information on the installation, commissioning and operation of the solar power inverter.

Observe this information for safe use (see “3 General safety instructions”, p. 9).

The installer and the operator must have access to this manual and must be familiar with the safety instructions.

The solar power inverter can be safely and normally operated if installed and used in accordance with this manual. Delta Energy Systems is not responsible for damage incurred by failure to comply with the installation and operating instructions in this manual.

1.2 Target audience of this manual

This manual is aimed at qualified electricians.

Only chapters “9 Production information”, p. 54 and “12 Diagnostics and Troubleshooting”, p. 76 are relevant to the operator. All other activities may only be performed by qualified electricians.

1.3 Warnings and Symbols

Where hazards may arise when working with the solar power convertor, the following hazard levels and symbols are used to indicate these hazards:

DANGER

Indicates a hazardous situation. An accident **will** result in death or serious injury.

WARNING

Indicates a hazardous situation. An accident **can** lead to death or severe physical injuries.

CAUTION

Indicates a hazardous situation. An accident **can** lead to medium or light physical injuries.

ATTENTION

Indicates a hazardous situation that can result in property damage.

NOTE

Contains general information on using the solar power inverter. A note does **not** indicate hazardous situations.

Where required, further, supplementary warning symbols are used in the safety instructions and warnings:

This symbol is a warning of a risk of electric shock due to high voltage.
The type and source of the hazard is explained in the safety instructions or warnings.

This symbol is a warning of general hazards.
The type and source of the hazard is explained in the safety instructions or warnings.

1.4 Conventions Used in This Document

1.4.1 Order of Instructions

Numbered instructions must be performed in the specified order.

1. Step
   → When the solar power inverter reacts to a step, this reaction is marked with an arrow.
2. Step
3. Step

The end of instructions is designated as follows:

☑ End of instructions

Instructions consisting of only one step are shown as follows:

► Step

1.4.2 User buttons and LEDs

User buttons and LEDs are shown in this document as follows:

User buttons on solar power inverter: ESC button.

LEDs on solar power inverter: ***Failure*** LED

LED symbol	Meaning
	LED stays on.
	LED flashes.
	LED is off.

1.4.3 Information on Display

Information shown on the solar power inverter display includes menus, settings and messages.

This information is shown in this manual as follows:

Menu names: **User settings** menu

Parameter names: ***Cos phi*** parameter.

2. Intended purpose

The solar power inverter may only be used as intended.

Proper use of the solar power inverter meets the following criteria:

- Use in stationary PV systems connected to the local power grid for converting the direct current in the PV system to alternating current and feeding it into the grid
- Use within the specified power range (see “15 Technical data”, p. 87) and under the specified ambient conditions (indoor area or covered outdoor area with up to IP65).

Any of the following uses of the solar power inverter is considered improper:

- Isolated operation. The solar power inverter has anti-islanding and other monitoring features.
- Use in mobile PV systems.

EC Declaration of Conformity

Producer:	Delta Energy Systems (Germany) GmbH
Address:	Tscheulinstr. 21, 79331 Teningen, Germany
Product description:	**Solar Inverter for Grid operation**

Model:		
	SOLIVIA2.0EUG4TR [1]	**EOE45010459**
	SOLIVIA2.5EUG4TR [1]	**EOE45010288**
	SOLIVIA3.0EUG4TR [1]	**EOE46010287**
	SOLIVIA3.3EUG4TR [1]	**EOE46010252**
	SOLIVIA3.6EUG4TR [1]	**EOE46010316**
	SOLIVIA5.0EUG4TR [2]	**EOE46010253**

The product described above in the form as delivered is in conformity with the provisions of the following European Directives:

2004/108/EC Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility

Immunity	EN 61000-6-2 : 2005
Emission	EN 61000-6-3 : 2007 + A1 : 2011
Harmonics / Flicker	EN 61000-3-2 : 2006 + A1 : 2009 + A2 : 2009
	[1] EN 61000-3-3 : 2008
	[2] EN 61000-3-12 : 2005 + EN 61000-3-11 : 2000

2006/95/EC Council Directive on the approximation of the laws of the Member States related to electrical equipment designed for use within certain voltage limits

Safety	IEC 62109-1 : 2010
	EN 62109-1 : 2010
	IEC 62109-2 : 2011
	EN 62109-2 : 2012

Teningen, Oct 1st 2012

Klaus Gremmelspacher		Andreas Hoischen	
Head R&D LOB Solar	V. Jekpulv	Head of LOB Solar	Hoischen
Name, Function	Signature	Name, Function	Signature

This declaration certifies the conformity to the specified directives but contains no assurance of properties. The safety documentation accompanying the product shall be considered in detail..

3. General safety instructions

DANGER

Risk of death by electrocution
Potentially fatal voltage is applied to the solar power inverter during operation. This potentially fatal voltage is still present for five minutes after all power sources have been disconnected.

- ► Never open the solar power inverter.
- ► Always disconnect the solar power inverter from power before installation, open the DC isolating switch and make sure neither can be accidentally reconnected.
- ► Wait at least five minutes until the capacitors have discharged.

DANGER

Risk of death or serious injury from electrocution
Potentially fatal voltage may be applied to the DC connections of the solar power inverter.

- ► Never disconnect the solar modules when the solar power inverter is under load.
- ► First switch off the grid connection so that the solar power inverter cannot feed energy into the grid.
- ► Then open the DC isolating switch.
- ► Make sure the DC connections cannot be accidentally touched.

- The solar power inverter can be safely and normally operated if installed and used in accordance with this manual (see IEC 62109-5.3.3). Delta Energy Systems is not responsible for damage incurred by failure to observe the installation and operating instructions in this manual. For this reason, be sure to observe and follow all instructions!
- The solar power inverter can only be connected to the energy provider's grid with advance approval. Installation and commissioning may only be performed by an electrician using the installation and commissioning instructions found in this manual.
- The solar power inverter must be disconnected from power and the solar modules before any work on it can be performed.
- The solar power inverter has a high leakage current value (see “15 Technical data”, p. 87). The ground wire **must** be connected before commissioning.
- Do not remove any warning signs that the manufacturer has installed on the solar power inverter.
- Improper handling of the solar power inverter my result in physical injury and damage to property. For this reason, observe and follow all general safety instructions and warnings.
- The solar power inverter contains no components that must be maintained or repaired by the operator or installer. All repairs must be performed by Delta Energy Systems. Opening the cover will void the warranty.
- Do not disconnect any cables when the solar power inverter is powered due to risk of a fault arc.
- To prevent lightning strikes, follow the relevant regulations applicable in your country.
- The surface of the solar power inverter can become very hot. The display section is protected by a special layer and can be touched with bare hands. Outside the display area, the solar power inverter should only be touched with safety gloves.
- The solar power inverter is very heavy (see “15 Technical data”, p. 87). The solar power inverter must be lifted and carried by at least two people.
- Only devices in compliance with SELV (EN 60950) may be connected to the RS485 and USB interfaces.
- All connections must be sufficiently insulated in order to comply with the IP65 protection rating. Unused connections must be closed by placing cover caps on the solar power inverter.

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4. Unpacking

WARNING

Risk of injury due to weight

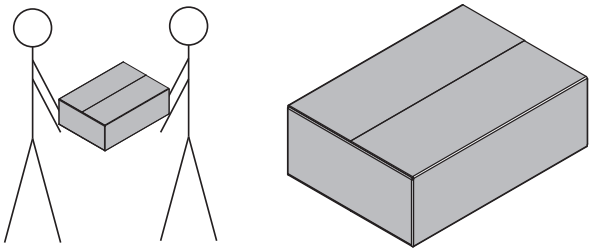
The weight of the solar power inverter (see “15 Technical data”, p. 87) can cause injury if not handled properly.

► The solar power inverter must be lifted and carried by at least two people.

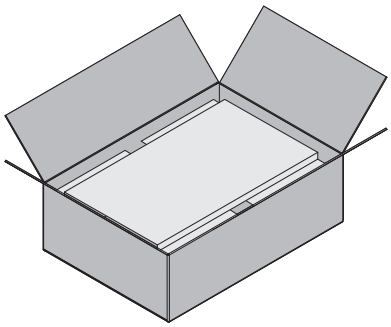
► Check the scope of delivery for completeness:
  – Mounting plate (a)
  – Operation and installation manual (b)
  – Wieland RST25i3S AC plug (c)
  – 2 M6 nuts and 2 M6 washers (d)
  – "Power limit" label (e)
  – Solar power inverter (f)
  – Retaining clip

► Check all parts for signs of damage!

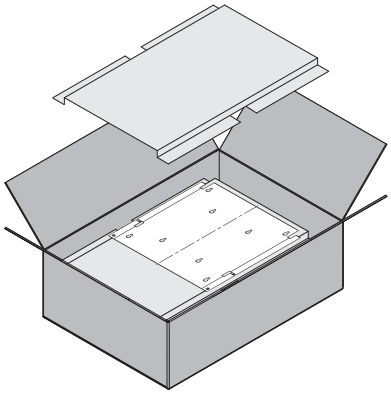
► Store the packaging in a safe place!



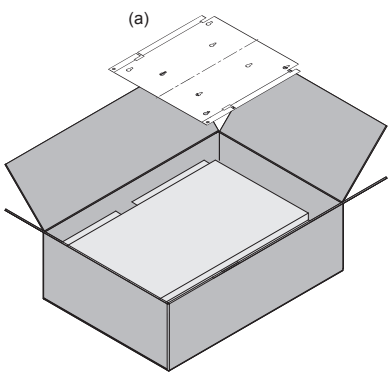
①



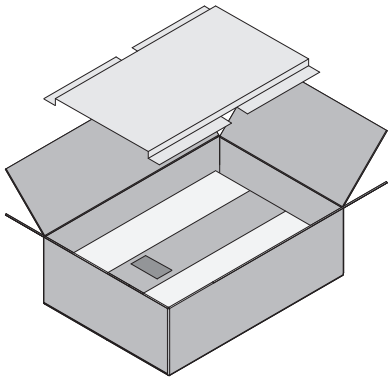
②



③



④



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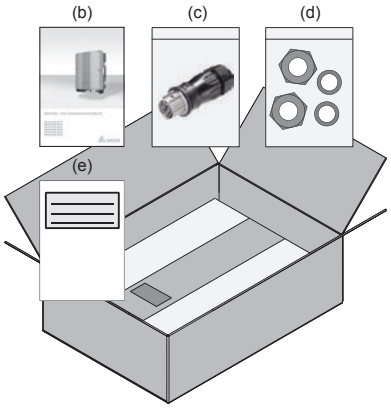
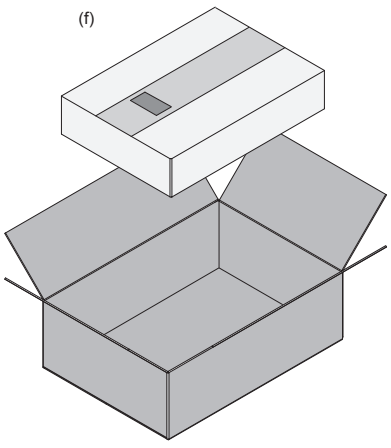


⑥



5. Product Description

5.1 Overview of Components and Connections

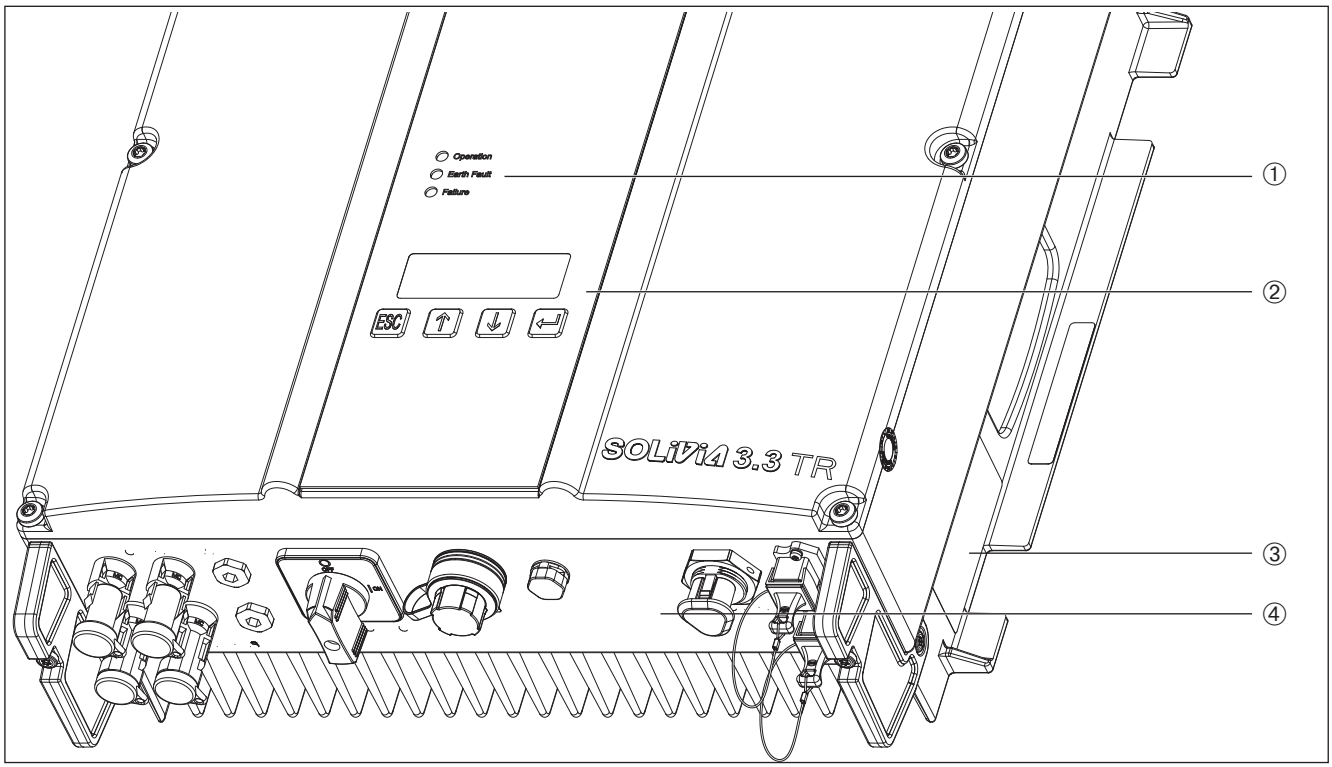


Fig. 5.1: Solar Power Inverter Components and Connections

No.	Component/Connection	Description
①	Status LEDs	See Chapter “5.3 Status LEDs”, p. 14
②	Display and Buttons	See Chapter “5.4 Display and Buttons”, p. 14
③	Type Plate	See Chapter “5.2 Type Plate”, p. 12
④	Electrical Connections	See Chapter “5.5 Electrical connections”, p. 18

5.2 Type Plate

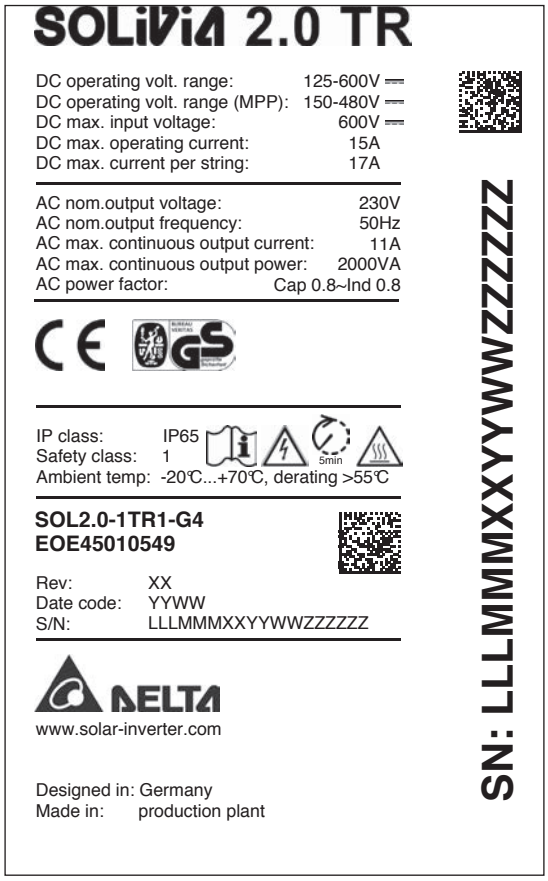


Fig. 5.2: SOL2.0-1TR1-G4 type plate

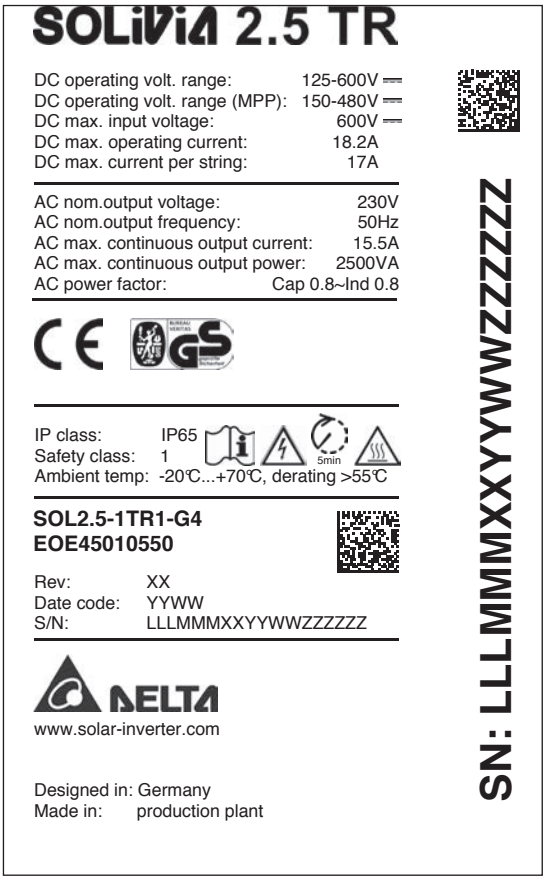


Fig. 5.3: SOL2.5-1TR1-G4 type plate

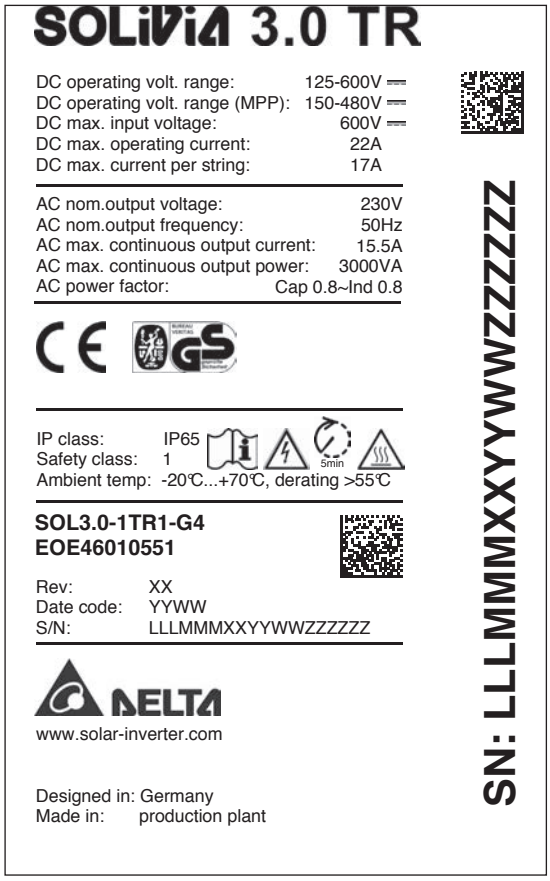


Fig. 5.4: SOL3.0-1TR1-G4 type plate

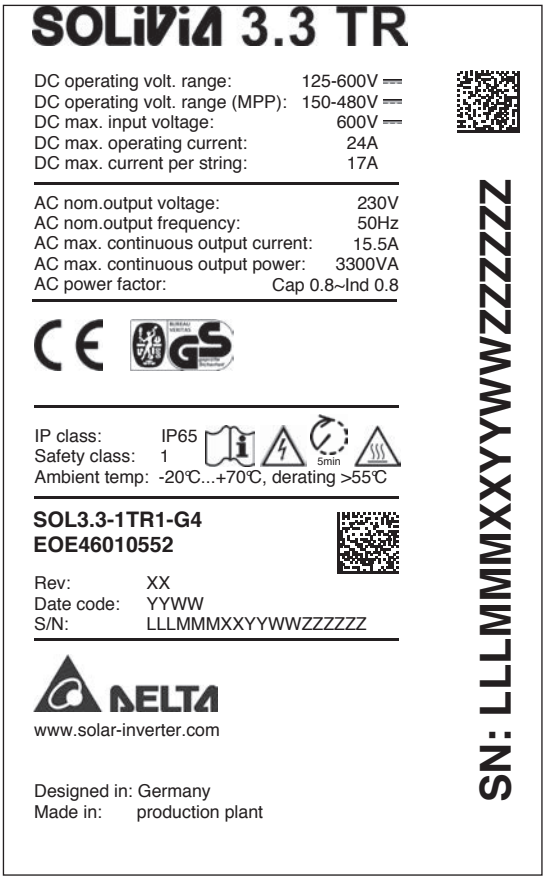


Fig. 5.5: SOL3.3-1TR1-G4 type plate

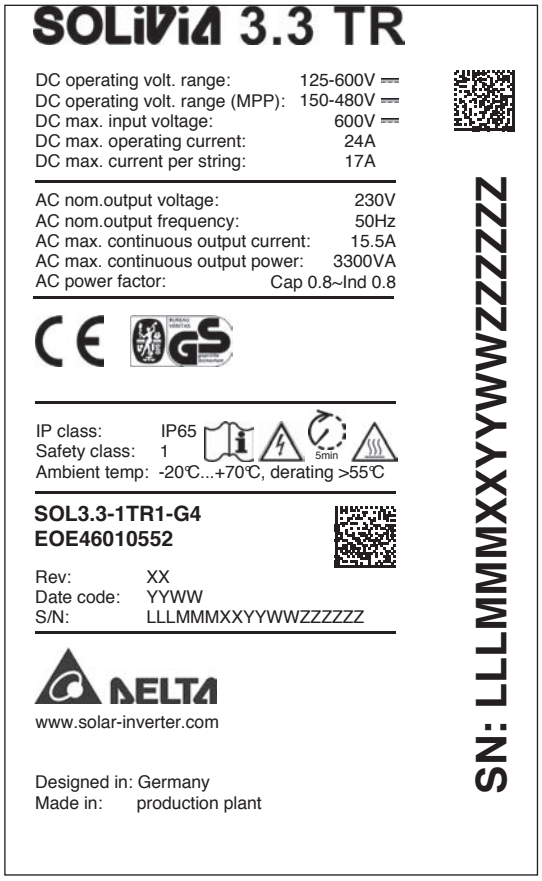


Fig. 5.6: SOL3.6-1TR1-G4 type plate

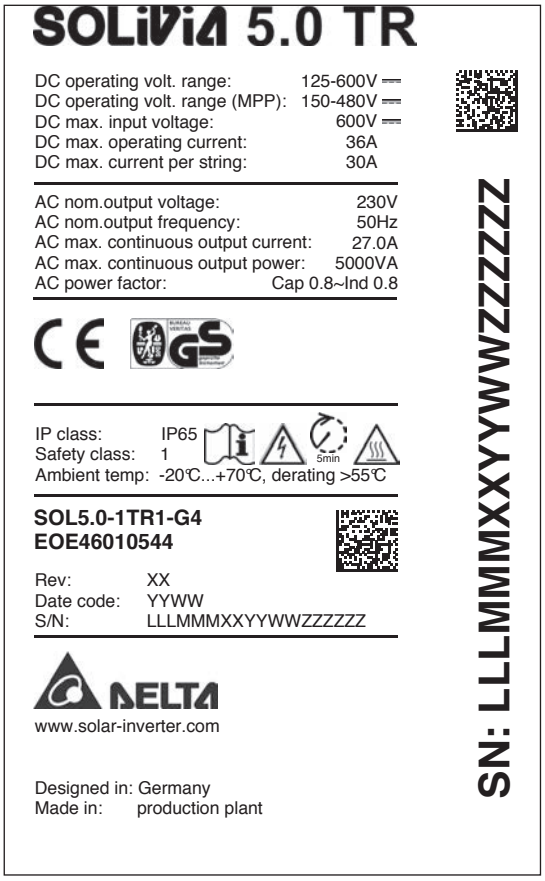


Fig. 5.7: SOL5.0-1TR1-G4 type plate

Meaning of Information on Type Plate

Warning Symbols on Type Plate	Meaning of Warning Symbols
5 min	**Risk of death by electrocution** Potentially fatal voltage is present when the solar power inverter is in operation that remains for five minutes after being disconnected from power. Never open the solar power inverter. The solar power inverter contains no components that must be maintained or repaired by the operator or installer. Opening the cover will void the warranty.
	Read the manual before working with the solar power inverter and follow the instructions contained in the manual.
	Risk of injury from high temperatures When in operation, the housing of the solar power inverter can become very hot. Only touch the housing of the solar power inverter (outside of the control panel) with safety gloves. The control panel itself is protected by a special surface.
DC operating volt. range	DC operating volt. range
DC operating volt. range (MPP)	DC operating volt. range (MPP)
DC max. input voltage	DC max. input voltage
DC max. operating current	DC max. operating current
DC max. current per string	DC max. current per string
AC nom. output voltage	AC nom. output voltage
AC nom. output frequency	AC nom. output frequency
AC max. continuous output current	AC max. continuous output current
AC max. continuous output power	AC max. apparent power
AC power factor	AC power factor (cos φ)
IP class	Degree of protection
Safety class	Protection rating
Ambient temperature/derating	Ambient temperature/derating

5.3 Status LEDs

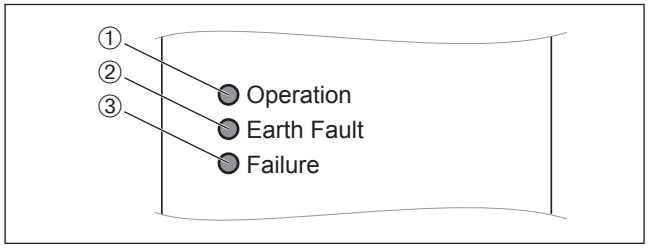


Fig. 5.8: Status LEDs

No.	Label	Designation	Color
①	*OPERATION*	Operation	Green
②	*EARTH FAULT*	Earth fault	Red
③	*FAILURE*	Failure	Yellow

Information on the LED messages can be found in “12 Diagnostics and Troubleshooting”, p. 76.

5.4 Display and Buttons

5.4.1 Overview

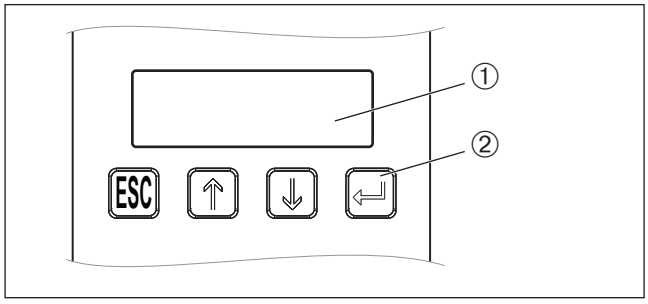


Fig. 5.9: Overview of Display and Buttons

No.	Designation
①	Display
②	Control Buttons

5.4.2 Display Layout

```
100 Install settings
 Language:   English
→Date and time
 Display settings
```

Fig. 5.10: Display

The display has four rows of 20 characters each.

The first row contains the name and number of the currently displayed menu.

The second to fourth rows show the menu elements.

A small arrow in the third row shows the currently selected menu item.

5.4.3 Control Buttons

Symbol	Use
ESC	• Exit current menu. • Cancel value setting.
⇑	• Move upwards in menu. • Set value (increase)
⇓	• Move downwards in menu. • Set a value (decrease).
↵	• Select menu item. • Open configurable value for editing. • Finish editing (adopt set value).

5.4.4 General Menu Structure

The menus have up to three levels:

[Main menu]

...

300 USB features

400 Production Info

410 Current Data

411 Current overview

412 Actual data AC

...

420 Day Statistics

430 Week Statistics

...

500 User Settings

...

Most menu names consist of a three-digit number and a menu title.

An overview of the complete menu structure can be found in Chapter “16 Appendix”, p. 89.

5.4.5 "Go to Menu" Function

NOTE

You can use the "Go to Menu" function to directly navigate to a particular menu.

A list of the available menu numbers can be found in “16.2 Overview of menu structure”, p. 90.

1. To start the **Go to Menu** function, press the ESC button for at least three seconds.

   → **Go to menu** opens.

```
    Go to menu

→Menu:          411
411 Current data
```

2. Press the ↵ button to enter the menu number.

   → The first digit flashes.

3. Use the ↓↑ buttons to set the first digit of the menu number.

   → You can only set menu numbers that actually exist. The name of the associated menu is displayed in the fourth display row.

4. Once you have set the first digit, press the ↵ button.

   → The second digit flashes.

5. Enter the second and third digit in the same manner.

6. Press the ↵ button.

   → The menu corresponding to the entered menu number is displayed.

5.4.6 Button combinations

The table lists special button combinations for the display buttons.

Buttons	Action
ESC ↓	Pressing the ESC and ↓ buttons at the same time displays the **100 Install Settings** menu where you can change the display language to be used, see “10.2 Display language”, p. 58.
↑ ↓	Pressing the ↓↑ buttons at the same time displays **800 Standard Menu**, where you can set the "standard menu", see “10.14 Standard menu”, p. 68.

5.4.7 Navigating the Menu

Use the ↓↑ buttons to navigate in a menu.

Use the ↓ button to move down in the menu, and the ↑ button to move up.

```
    SOLIVIA ##
 --------------------
→Install settings
 Options
```

↓ ↑

```
    SOLIVIA ##
 Install settings
→Options
 USB features
```

↓ ↑

```
    SOLIVIA ##
 Options
→USB features
 Production info
```

5.4.8 Selecting a Submenu

► In order to open a submenu, press the ↵ button.

```
    SOLIVIA ##
 USB features
→Production info
 User settings
```

↵

```
400 Production info
 --------------------
→Current data
 Day statistics
```

5.4.9 Exiting a Menu

► Press the ESC button to return to the higher menu.

```
400 Production info
 --------------------
→Current data
 Day statistics
```

ESC

```
    SOLIVIA ##
 USB features
→Production info
 User settings
```

5.4.10 Setting Values

You can set various parameters on the display. Use the ↓ ↑ buttons to change the parameter values.

The ↑ button increases the value of the parameter.

The ↓ button decreases the value of the parameter.

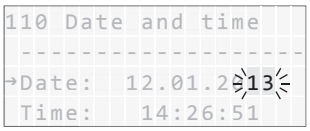
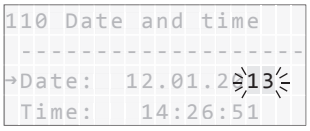
The ESC button can be used to cancel the setting, and the original value is then displayed.

The ↵ button applies the new parameter value.

The example on the next page illustrates the procedure for changing the value of a parameter.

Example: Setting the date

Buttons	Action	Result
ESC	1. Press the ESC button until the main menu is displayed.	
↑ ↓	2. In the main menu, select **Install Settings** using the ↓ ↑ buttons.	SOLIVIA ## --- →Install settings Options
↵	3. Press the ↵ button to open **100 Install Settings**.	100 Install settings --- →Language: English Date and time
↑ ↓	4. Select **Date and Time** using the ↓ ↑ buttons.	100 Install settings Language: English →Date and time Display settings
↵	5. Press the ↵ button to open **110 Date and Time**.	110 Date and time --- →Date: 25.05.2012 Time: 14:26:51
↑ ↓	6. Select ***Date*** using the ↓ ↑ buttons.	110 Date and time --- →Date: 25.05.2012 Time: 14:26:51
↵	7. Press the ↵ **BUTTON TO BEGIN CONFIGURATION.** → The digits for the first value (in this case the day) flash.	110 Date and time --- →Date: 25 05.2012 Time: 14:26:51
↑ ↓	8. Select the day using the ↓ ↑ buttons.	110 Date and time --- →Date: 12 05.2012 Time: 14:26:51
↵	9. Press the ↵ button to apply the new value. → The digits for the second value (in this case the month) flash.	110 Date and time --- →Date: 12 05 2012 Time: 14:26:51
↑ ↓	10. Select the month using the ↓ ↑ buttons.	110 Date and time --- →Date: 12 01 2012 Time: 14:26:51
↵	11. Press the ↵ button to apply the new value. → The digits for the last value (in this case the year) flash.	110 Date and time --- →Date: 12.01.2 12 Time: 14:26:51

Buttons	Action	Result
	12. Select the year using the ↓↑ buttons.	
	13. Press the ↵ button to apply the new value.	
	☑ The value is adopted and the editing mode is exited.	

EN

5.5 Electrical connections

5.5.1 Overview

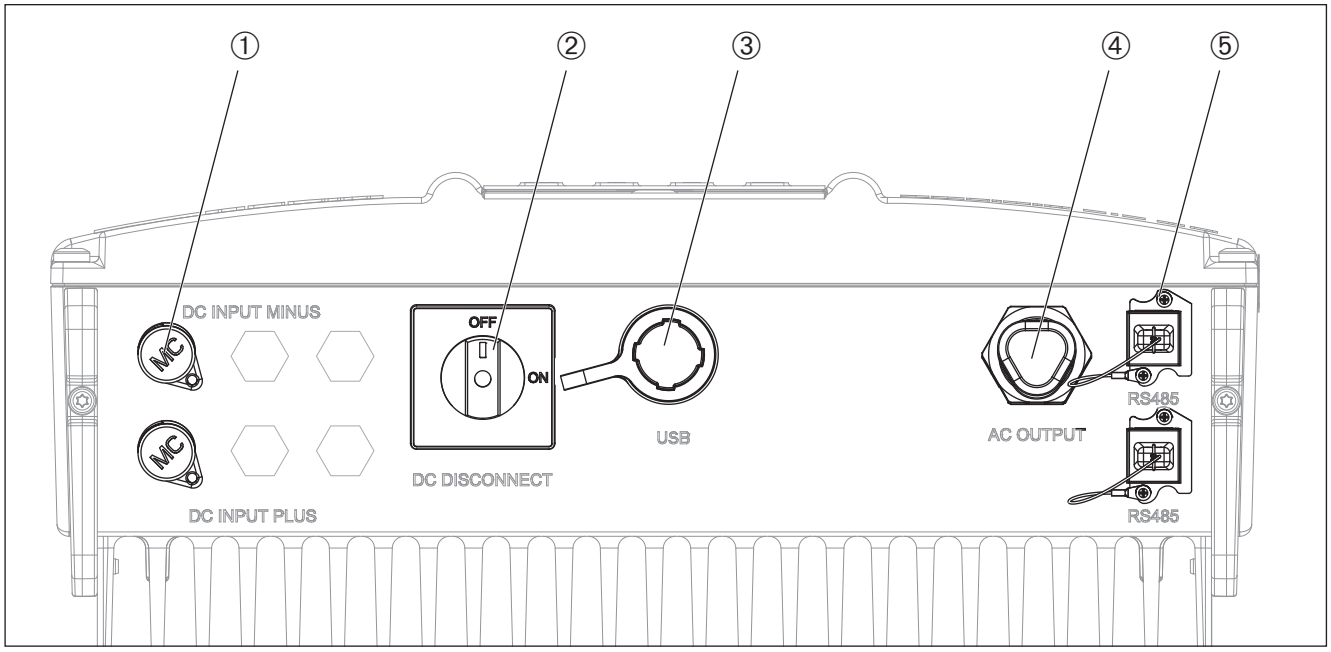


Fig. 5.11: Electrical Connections for SOL2.0-1TR1-G4

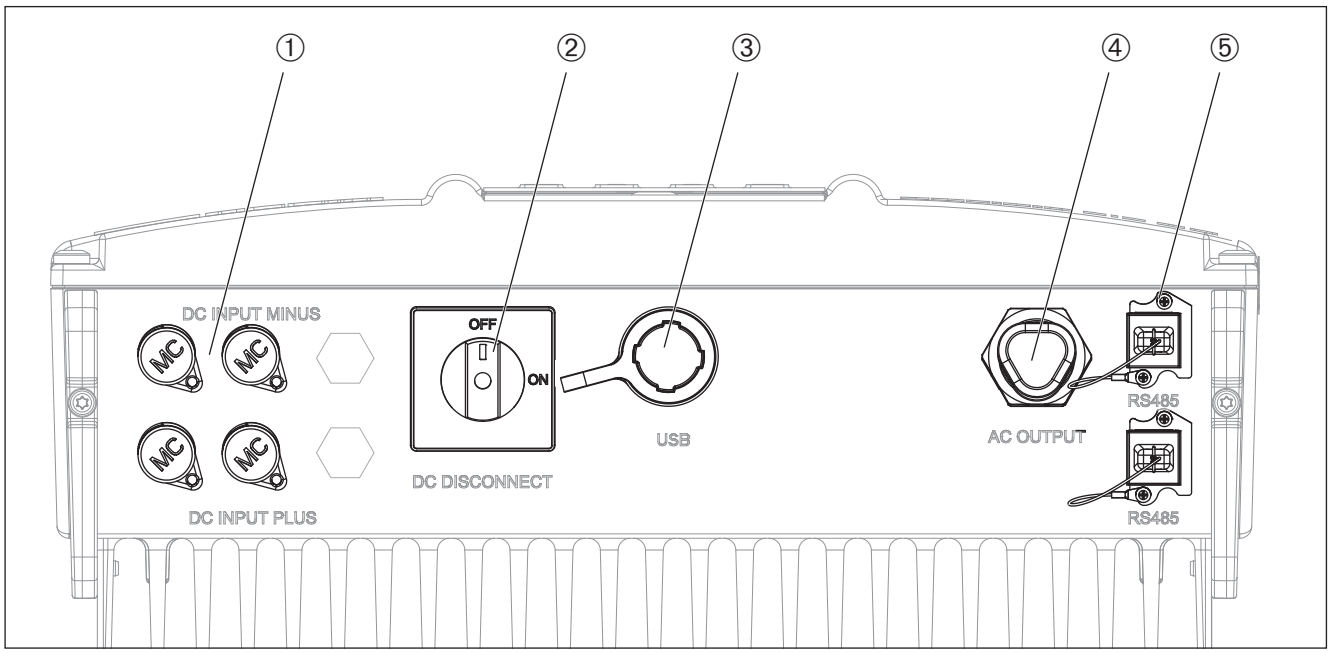


Fig. 5.12: Electrical Connections for SOL2.5 / 3.0 / 3.3 / 3.6-1TR1-G4

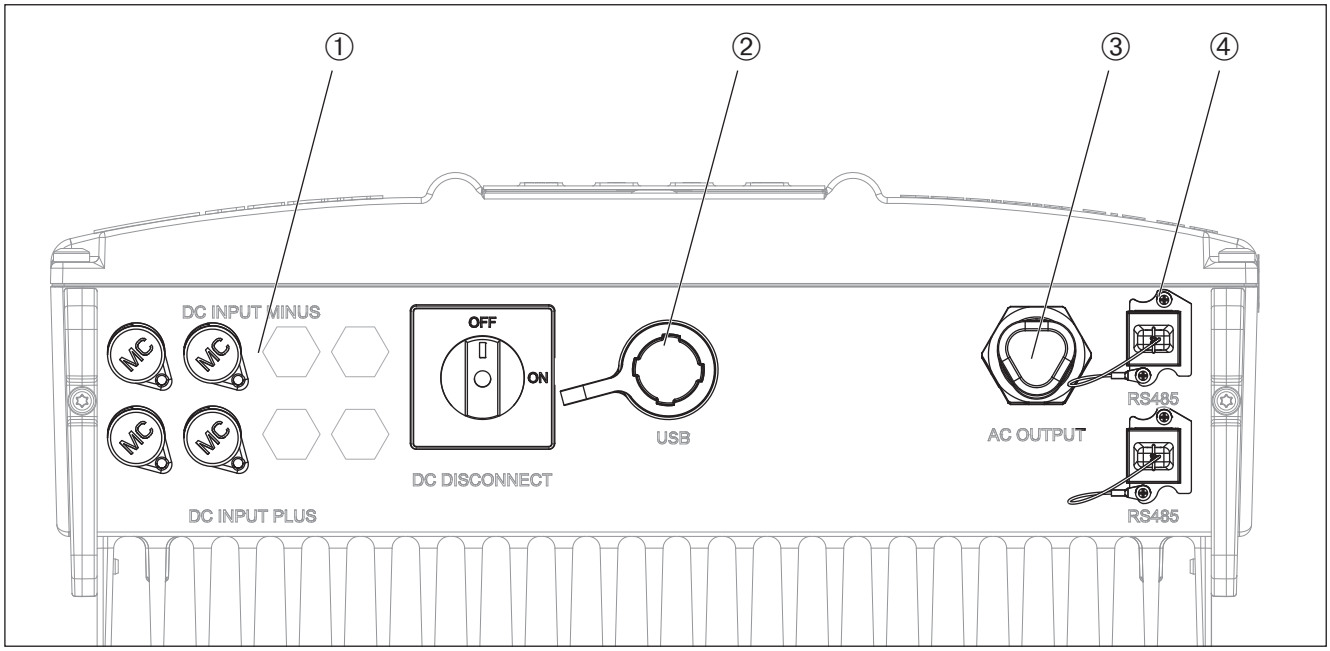


Fig. 5.13: Electrical Connections for SOL5.0-1TR1-G4

No.	Designation	Description
①	DC Connections	See Chapter “5.5.2 DC connections and DC isolating switch”, p. 20
②	DC Isolating Switch	See Chapter “5.5.2 DC connections and DC isolating switch”, p. 20
③	USB Interface	See Chapter “5.5.5 USB interface”, p. 20
④	AC Connection	See Chapter “5.5.3 AC connection”, p. 20
⑤	RS485 interfaces	See Chapter “5.5.4 RS485 interface (EIA485)”, p. 20

5.5.2 DC connections and DC isolating switch

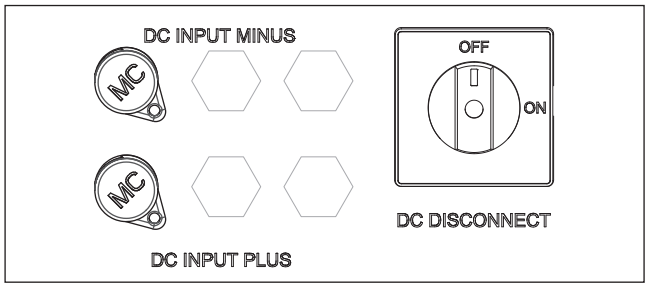


Fig. 5.14: DC connections and DC isolating switch for SOL2.0-1TR1-G4

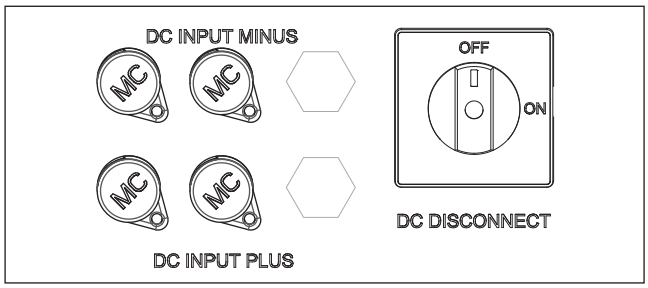


Fig. 5.15: DC connections and DC isolating switch for SOL2.5- / 3.0 / 3.3 / 3.6-1TR1-G4

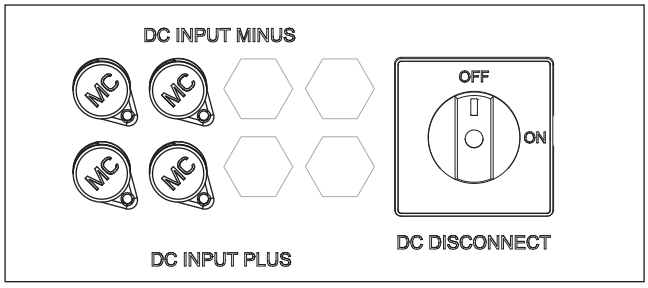


Fig. 5.16: DC connections and DC isolating switch for SOL5.0-1TR1-G4

The DC connections are used for connecting the solar module string(s) to the solar power inverter.

The integrated DC isolating switch can separate the solar power inverter from the DC voltage of the solar modules.

The maximum permissible input current is 29 A for each DC connection.

Connection type: Multi-contact MC4 connector, paired plug (DC+) and socket (DC–):

Solar power inverter	Number of DC inputs
SOL2.0-1TR1-G4	1
SOL2.5 / 3.0 / 3.3 / 3.6 / 5.0-1TR1-G4	2

5.5.3 AC connection

The AC connection is used for connecting the solar power inverter to the grid.

The connection is made using a triple-core cable (L, N, PE)

Connection type: Wieland RST25i3s, plug supplied in the scope of delivery

5.5.4 RS485 interface (EIA485)

The solar power inverter has two RS485 interfaces to which a computer or a monitoring system can be connected.

The RS485 interfaces are internally wired 1:1. This means that both RS485 interfaces can be used as an input or an output.

Connection type: 2 x RJ45

5.5.5 USB interface

The USB interface is used for saving and loading data and reports.

Supported functions:

- Updating firmware
- Saving and loading settings
- Saving swap data
- Create reports
- Service

See “11 Saving and loading data and settings”, p. 69 for a detailed description of the functions.

The USB connection is also used in Italy to feed the signals "Segnale esterno" and "Teledistacco".

Connection type: USB A

6. Operating Behavior

6.1 General Principle of Operation

The solar power inverter converts DC electricity into AC electricity, which is then fed into the local power grid.

MPP Tracking

The solar power inverter has an MPP tracker. The MPP (Maximum Power Point) tracker is an automatic function that continuously searches for the operating point with the highest possible power.

On the normal setting, the MPP tracker searches the DC input voltage range near the current operating point. If a higher power point is found, the solar power inverter sets this as the new operating point.

The manual "Shadowing" function can be used to set the MPP tracker to scan over a wider DC voltage range. This MPP tracking function is especially useful when small shadows regularly pass over the solar modules, e.g., from chimneys or trees. In order to adapt the function to local conditions as precisely as possible, the extended MPP tracking can be configured in three stages.

Electrical Isolation

The AC and DC sides of the solar power inverter are electrically isolated by a high frequency transformer. This makes it impossible for DC electricity to reach the AC side of the inverter.

Anti-Islanding

The integrated anti-islanding device switches off the solar power inverter when the grid fails.

Temperature Control

The convection cooling system provides optimal heat dissipation.

An internal temperature controller reduces the output power at ambient temperatures in the upper operating range. The higher the operating temperature, the greater the power reduction. It is possible for the power reduction to be adjusted to 0 kW.

6.2 Impact of DC Input Voltage

The specific voltage values mentioned in this section can be found in Chapter “15 Technical data”, p. 87.

The **maximum input voltage** must never be exceeded. Measure the input voltage and use an overvoltage protection device on the DC side to prevent higher voltages from reaching the inverter. The maximum open-circuit voltage occurs at the lowest assumed temperature. More exact information on temperature dependency is provided in the solar module data sheet.

The **feed-in voltage range** of the solar power inverter defines the range of input voltages over which the solar power inverter will feed electricity into the grid.

The **MPP input voltage range** of the solar power inverter defines the range of input voltages over which the MPP tracker is activated.

6.3 Configuring Permanent Active and Reactive Power Reduction

The settings for reduction of active power and/or reactive power can be configured permanently during initial commissioning. After completion of initial commissioning the values can only be changed using a PIN.

6.4 Functions Affecting Operating Behavior

The solar power inverter offers various functions for affecting operating behavior:

- Active Power Control
- Reactive Power Control
- Insulation and grounding monitoring
- Extended MPP tracking in the case of partial shadowing of the solar modules

The availability of individual functions depends on the configured country and/or grid.

A detailed description of the functions is provided in Chapter “10 Settings”, p. 58.

6.5 Balancing Asymmetrical Grid Loads

When using single-phase power inverters in a three-phase grid, an asymmetric phase failure can lead to unreliable grid load.

In some countries, there are specific limits for the grid load, for example, in Germany this is max. 4.6 kVA between two phases.

If an unreliable grid load can occur during installation, single-phase solar power inverters can only be operated in these countries when a SOLIVIA Gateway M1 G2 is installed as well.

The Gateway controls the feed-in so that an impermissible grid load cannot occur during an asymmetric phase failure.

The asymmetrical grid load balancing can be activated during the initial commissioning.

After completion of initial commissioning, the function can only be changed using a PIN.

A detailed description of this function can be found in Chapter “7.1 Planning the installation”, p. 24.

6.6 Data Analysis and Communication

The solar power inverter has a comprehensive system for recording operating behavior.

The log can be viewed directly on the display. It is also possible to view the log on a computer using the communication interface (RS485).

Connecting a SOLIVIA Gateway M1 G2 to the solar power inverter allows this information to be accessed worldwide via the Internet.

All information can be saved to a USB drive to be used later.

The following information and data are logged:

Production Information

The most important production information is recorded in statistics for day, week, month, year and total runtime. There are also special statistics for the last seven days the solar power inverter was in operation.

All production information is backed up to a separate hard drive monthly.

Configuration Settings

The configuration settings of the solar power inverter can be exchanged between solar power inverters of the same type by using a USB drive.

This makes switching solar power inverters easier, for example.

Warning and Error Messages

Every warning or error message is stored in the solar power inverter with a time stamp. The messages are stored in the event log or in the internal log, depending on the cause of the error.

The event log is intended above all for the installer and should make analyzing and resolving problems easier.

The internal log helps Delta Solar Support when analyzing more difficult problems.

Reports

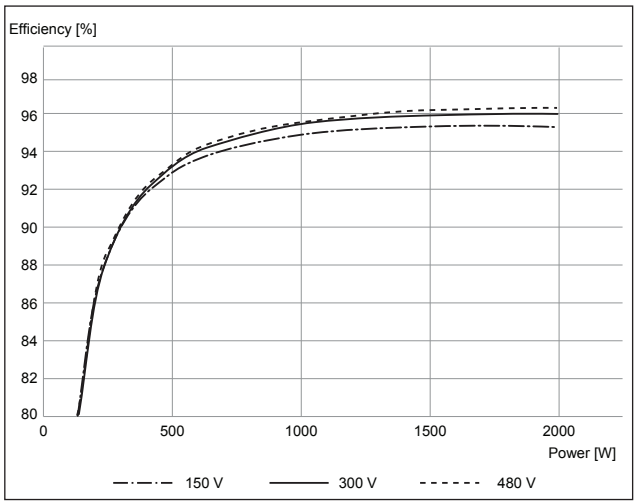
The reports combine the various information on production, events, settings, parameter changes and errors.

For grids as per VDE AR N 4105, the five last failures are also saved together with the settings in a separate log.

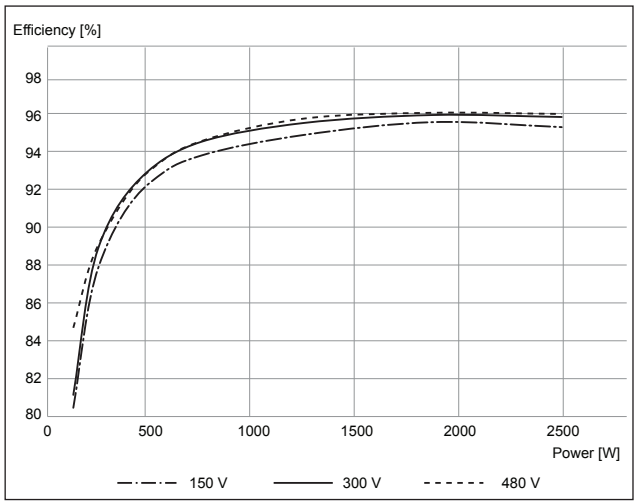
6.7 Characteristic Curves

Efficiency Curves

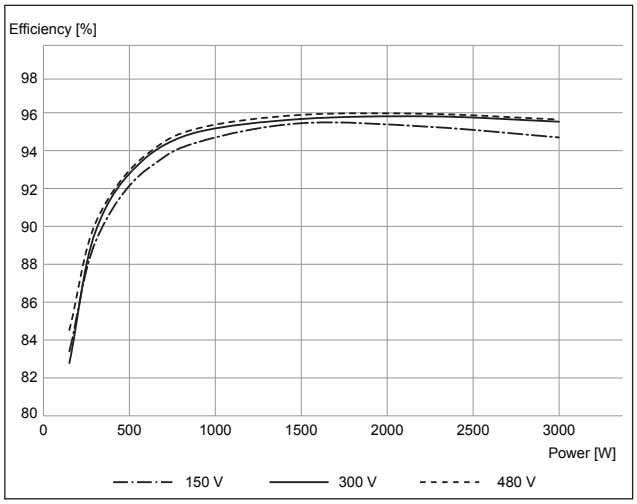
SOL2.0-1TR1-G4



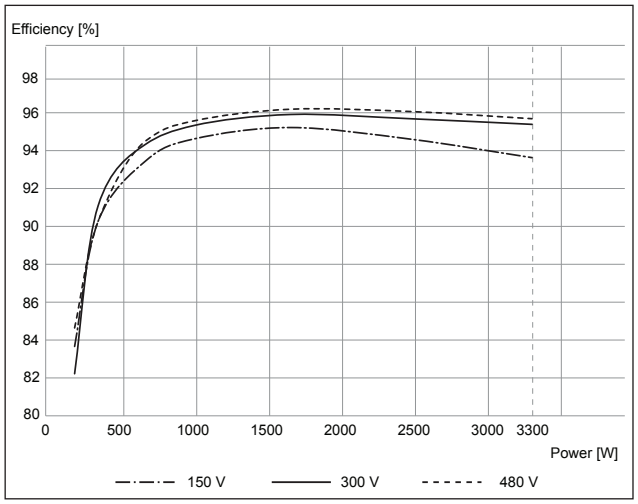
SOL2.5-1TR1-G4



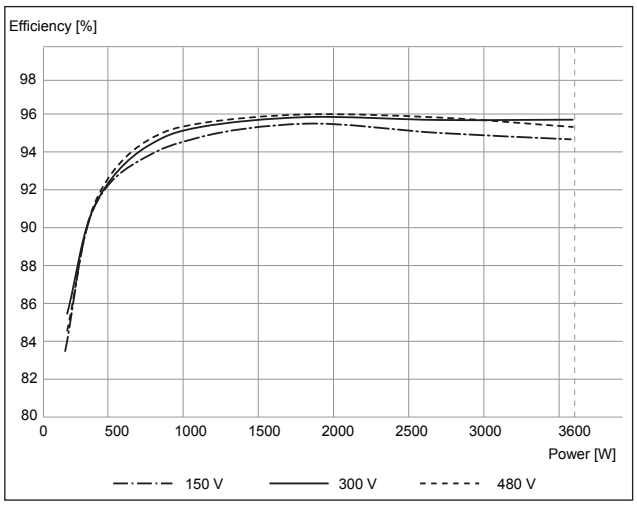
SOL3.0-1TR1-G4



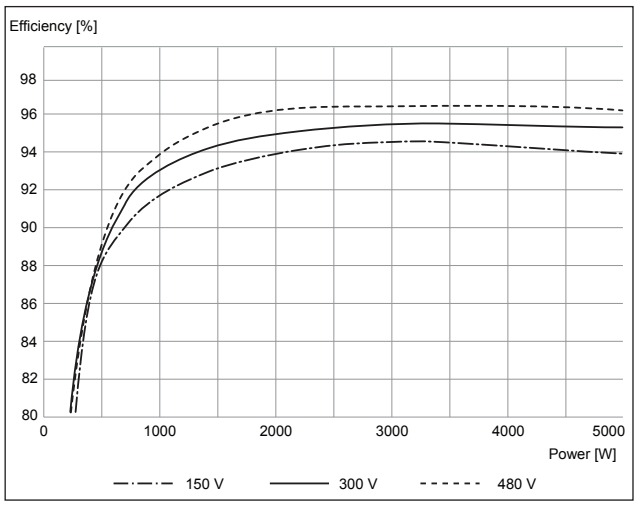
SOL3.3-1TR1-G4



SOL3.6-1TR1-G4



SOL5.0-1TR1-G4



7. Installation

DANGER

Risk of death by electrocution
Potentially fatal voltage is applied to the solar power inverter during operation. This potentially fatal voltage is still present for five minutes after all power sources have been disconnected.

- ► Never open the solar power inverter.
- ► Always disconnect the solar power inverter from the grid before installation, turn the DC isolating switch to "OFF" and make sure neither can be accidentally reconnected.
- ► Wait at least five minutes until the capacitors have discharged.

NOTE

Read this Chapter before you start installation.

NOTE

Important note on installation in Italy
If you installing the solar power inverter in Italy in a PV system equal to or less than 6 kW, you also need the following accessories:

- ► SOLIVIA USB/I card
- ► SOLIVIA cable kit IP65

For further information, see Chapter "7.6 Install USB card (only for Italy and PV systems equal to or less than 6 kW)", p. 34

7.1 Planning the installation

7.1.1 General Instructions

- ► Possible noise emissions can be disruptive when the device is used in living areas. Therefore, choose your installation location carefully.
- ► Always use the mounting plate supplied with the solar power inverter.
- ► Check that the wall is capable of bearing the heavy load of the device.
- ► Mount the solar power inverter on a fireproof wall.
- ► First mount the solar power inverter on the wall and then establish the electrical connections.
- ► Mount the solar power inverter so that the LEDs and display can be easily seen. Make sure the reading angle and installation height are sufficient.
- ► Mount the solar power inverter on a vibration-free wall to avoid disruptive vibrations.
- ► Use dowels and screws for the installation that are suitable for the wall material and the heavy weight.
- ► Mount the solar power inverter vertically, see Fig. 7.1, p. 24.

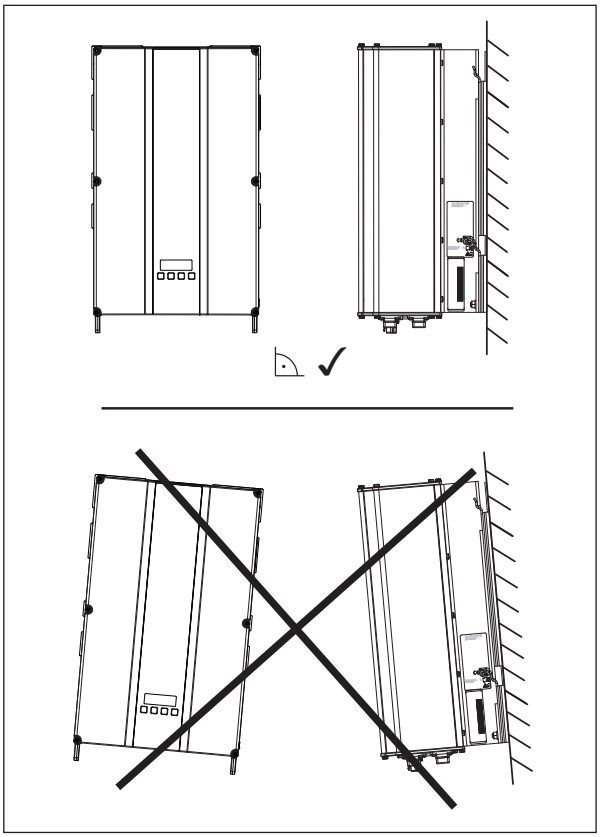


Fig. 7.1: Mounting alignment

7.1.2 Ambient Conditions

- ► The solar power inverter has an IP65 degree of protection and can be installed indoors or in protected outdoor areas.
- ► Note the **operating temperature range at full power without derating** and the **maximum operating temperature range**.

  When the first operating temperature range is exceeded, the solar power inverter reduces the amount of power generated.

  – Be sure to adhere to the specified minimum clearances from walls and other solar power inverters when installing the device (see Fig. 7.2, p. 25.).

  – Do not install two solar power inverters directly above one another.

  – Avoid direct sunlight.

  – Ensure adequate air circulation. Hot air must be able to dissipate upward. For this reason, installation directly under a closed roof is not recommended.

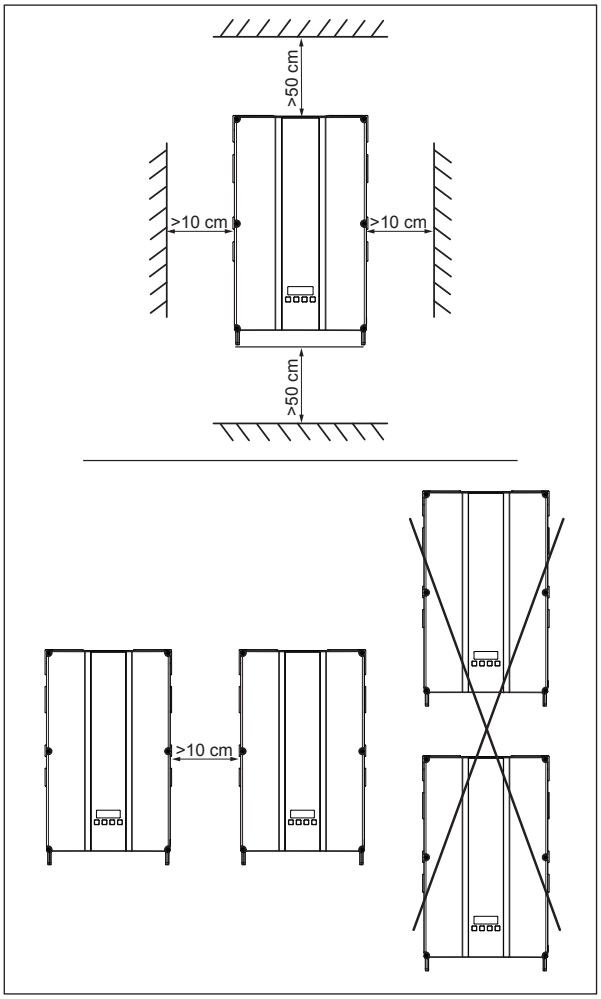


Fig. 7.2: Mounting clearances for correct convection

- ► Avoid heavy soiling. Dust can impair the performance of the device.
- ► Protect the solar power inverter from heavy rain and snow deposits.

7.1.3 Consideration of Asymmetrical Grid Load

For installations that are connected to a 3-phase grid and for which several 1-phase solar power inverters feed into one and the same phase, a failure can lead to an asymmetric grid load.

An asymmetric grid load occurs when outputs are fed into the individual phases.

If, regulations exist for your country regarding the maximum allowed asymmetric grid load, the use of a SOLIVIA Gateway M1 G2 is stipulated for installations of this kind.

Fig. 7.3, p. 26 shows an example of such an installation for Germany. In Germany, the asymmetrical grid load must not exceed 4.6 kW.

The SOLIVIA 11 EU G4 TR three-phase solar power inverter does not experience this problem, because it controls the feed-in internally and always distributes the fed-in power evenly among all three phases.

The situation is different for single-phase solar power inverters. If phase L1 or L2 fails, an asymmetrical grid load greater than 4.6 kW can occur.

In this case, the Gateway controls the feed-in via the RS485 interface and ensures that an impermissible asymmetrical grid load cannot occur.

If a Gateway is used to balance asymmetrical grid loads, you must activate the "asymmetrical grid load balancing" function on each single-phase solar power inverter during initial commissioning.

If the RS485 connection between the Gateway and a single-phase solar power inverter is interrupted, the function switches off the solar power inverter after a specified time for safety reasons.

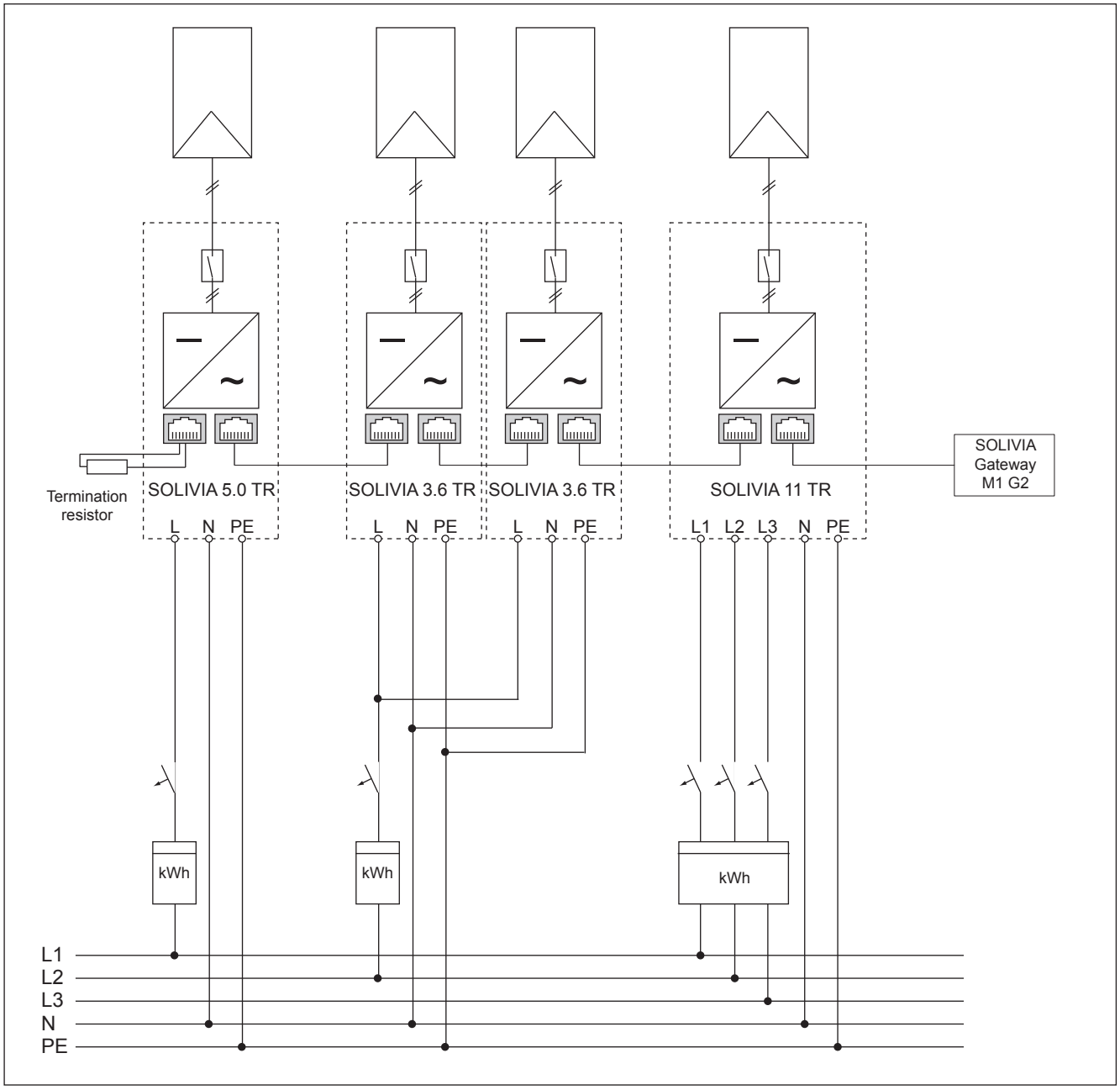


Fig. 7.3: Example: Multiple solar power inverters connected together

7.2 Attach solar power inverter

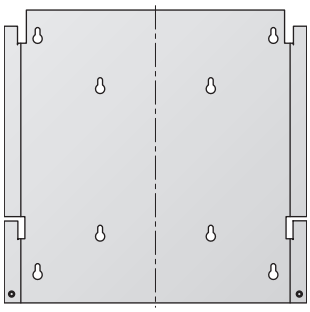
WARNING

Risk of injury due to weight
The solar power inverter is very heavy (see “15 Technical data”, p. 87). Improper handling may result in injury.
► The solar power inverter must be lifted and carried by at least two people.

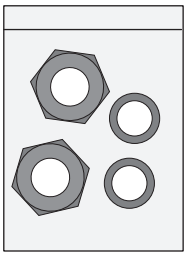
7.2.1 Required Tools and Accessories

Included in delivery:

Mounting plate



Mounting nuts and washers: 2 pcs. each for mounting the solar power inverter to the mounting plate



Retaining clip

Not included in delivery:

- **Screws** (Ø6 mm) + **dowels** for attaching the mounting plate to the wall. At least four screws are required.
- **Drill** and **drill bits** suitable for the wall material and size of the dowels.
- **Screwdriver** or **wrench** fitting the screws.

7.2.2 Installing Mounting Plate

You can use the mounting plate as a template for marking the positions of the holes to be drilled.

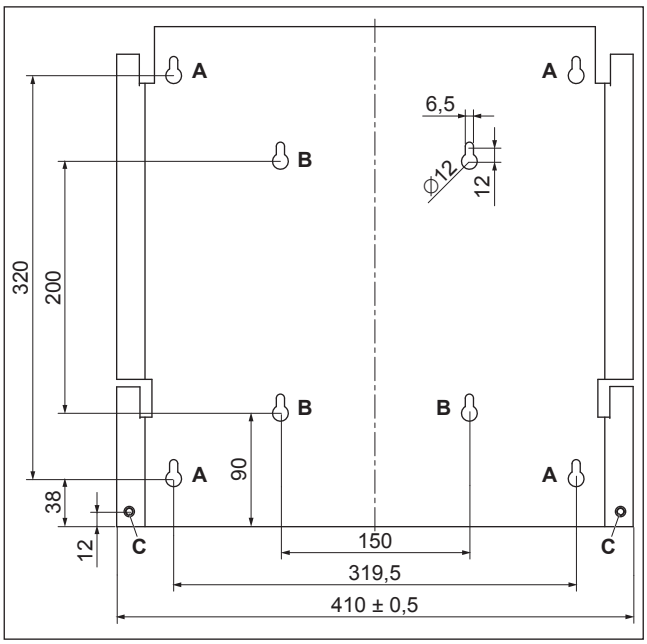


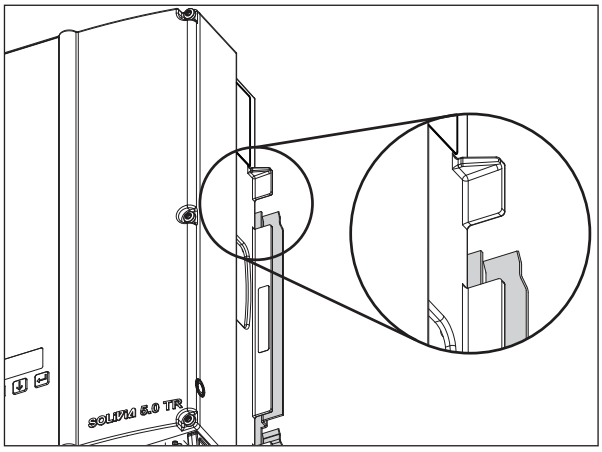
Fig. 7.4: Dimensioned drawing of the mounting plate

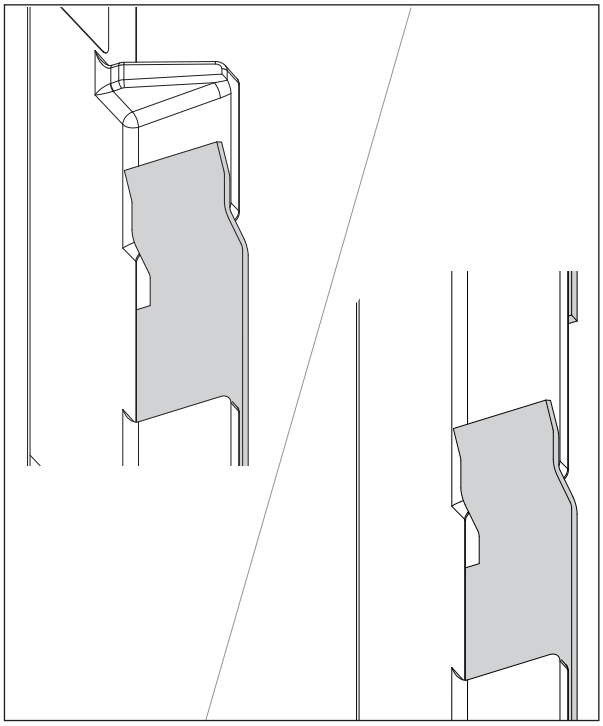
1. Attach the mounting plate to the wall using at least four screws (Ø 6 mm) and dowels. Use the four holes **A** or the four holes **B** for the four screws (see Fig. 7.4, p. 27).
2. Screw the screws tightly into the wall.

EN

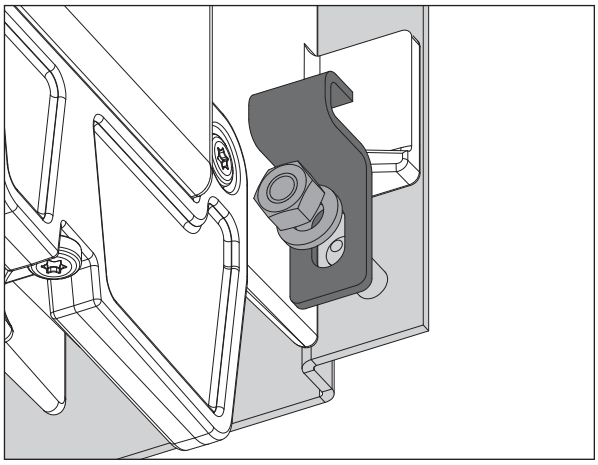
7.2.3 Mounting Solar Power Inverter

1. Attach the solar power inverter to the mounting plate.





2. Place the retaining clip on the stud bolts of the mounting plate and attach the retaining clip with the washer and the mounting nuts.



3. Check the installation.

☑ Physical installation of the solar power inverter is now complete.

7.3 Connecting the grid

DANGER

Risk of death or serious injury from electrocution

► Disconnect the AC conductor from power before removing or inserting the AC plug.

7.3.1 General Instructions

The solar power inverter is connected to the local power grid with an AC connection, see Fig. 7.5, p. 28.

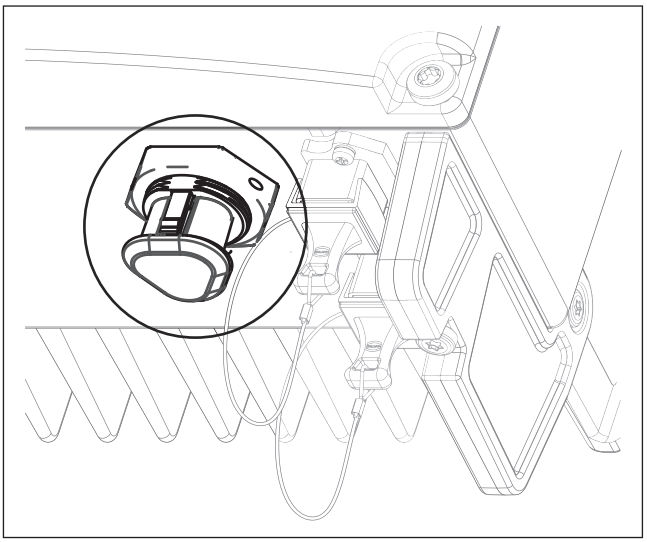


Fig. 7.5: Location of AC connection

The round AC plug has a coupling to protect against accidental removal. This coupling can be disengaged with a screwdriver.

Use a flexible triple-core cable (L, N, PE) with a conductor cross-section from 2.5 to 4.0 mm² (for France: coefficient k=1).

Observe the required grid impedance at the grid connection point (cable length, conductor cross-section).

Select the cable length and conductor cross-section so that the conductor temperature and cable losses are as small as possible. In some countries (e.g., France and Germany) specific requirements for the system installation must be satisfied (UTE C15-712-1, VDE 0100 712). These requirements specify the minimum cable cross-section and the protective measures required to prevent overheating due to high currents. Always adhere to the specific requirements of your country.

The energy meter must be installed between the solar power inverter and the grid feed-in point. Observe the directives of your local electricity supplier when doing this.

The following table shows the maximum permissible trigger current for the automatic circuit breaker (type B).

Solar power inverter	Maximum Permitted Fuse Rating
SOL2.0-1TR1-G4	16.0 A
SOL2.5-1TR1-G4	20.0 A
SOL3.0-1TR1-G4	
SOL3.3-1TR1-G4	
SOL3.6-1TR1-G4	25.0 A
SOL5.0-1TR1-G4	

The AC and DC sides of the solar power inverter are electrically isolated. This makes it impossible for DC electricity to reach the AC side of the inverter. If a residual current device is required, we recommend using a 300-mA residual current device. However, be sure to always adhere to the specific regulations applicable in your country.

The typical leakage current is less than 3.5 mA.

NOTE

For power inverters connected in parallel, the short circuit current of the PV system is increased at the grid connection point to the public power grid.

To protect the user and the system, install the required safety and protection devices (e.g., automatic circuit breaker and/or overvoltage protection devices).

A special kit for France is available from Delta. This kit contains all components required to meet the requirements specified in UTE C15-712-1 (see Chapter “16.1 Order numbers”, p. 89).

7.3.2 Required Tools and Accessories

Included in delivery:

Round AC plug

Wieland RST25i3S

Not included in delivery:

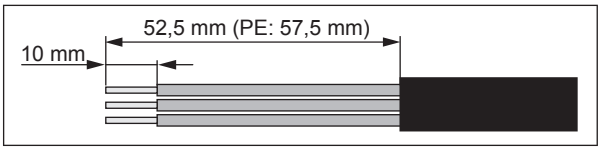
- **Flexible triple-core cable** (L, N, PE) with a conductor cross-section from 2.5 mm² to 4 mm²
- **Cable end sleeves** suitable for the conductor cross-section.
- **Cable** strain-relief.
- **Locking washer** for connecting the ground wire to the solar power inverter (see Fig. 7.4, p. 27, item **C**).

7.3.3 Establishing Connection

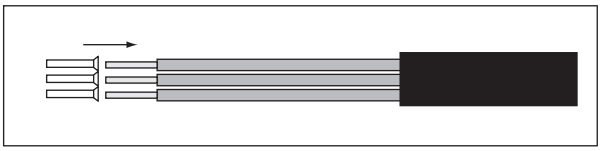
1. Remove the cable sheath as shown and remove 10 mm of insulation from each wire end.

NOTE

Observe the correct polarity of the round plug. An incorrect configuration can destroy the solar power inverter.

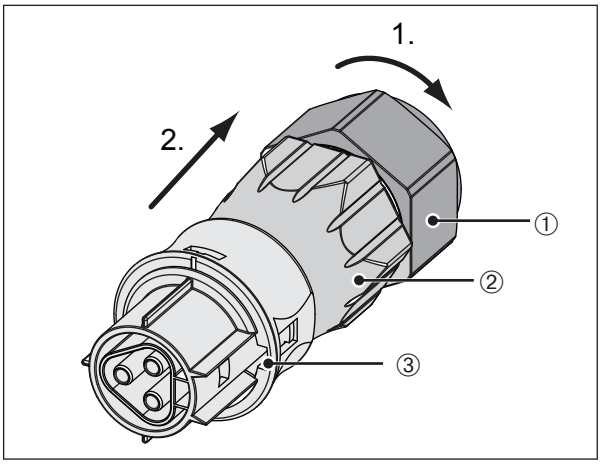


2. Place the end sleeves on the exposed wire ends and crimp them on.

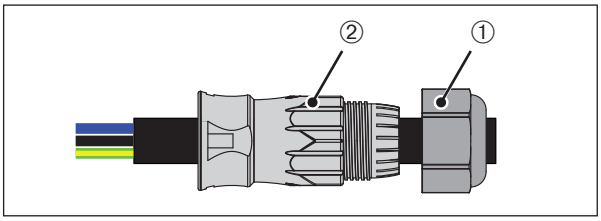


3. Connect the AC cable to the AC plug as described below.

► Unscrew the nut ① from the cable housing ② and then remove the cable housing from the socket insert ③.

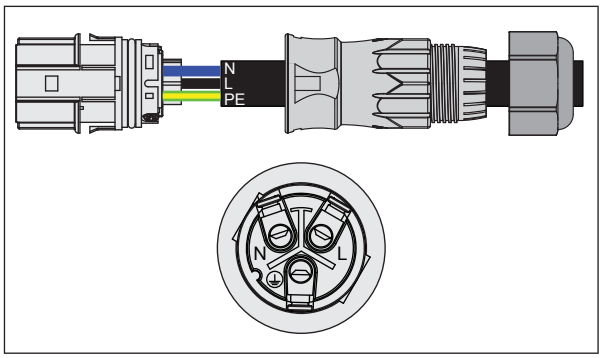


► Slide the nut ① and cable housing ② onto the AC cable.

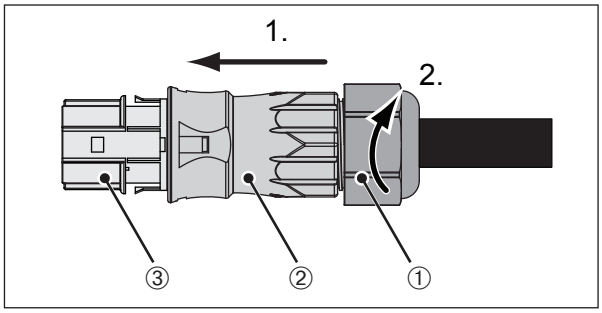


► Insert the wires of the AC cable into the pin insert connections. Observe the correct phase sequence when doing this.

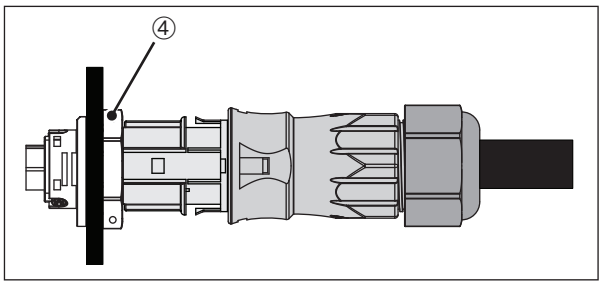
► Tighten the screws of the pin insert to fix the wires in place.



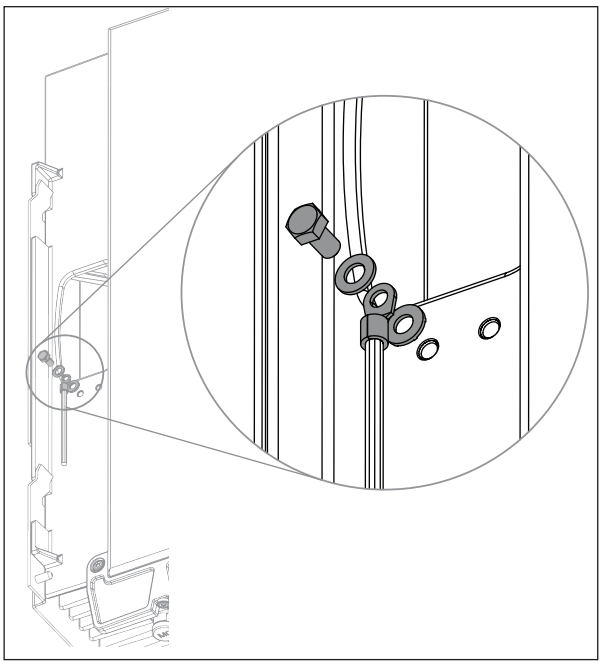
► Screw the cable housing ② onto the socket insert ③ and then screw the nut ① onto the cable housing.



► Insert the AC plug into the AC socket ④ on the solar power inverter until the AC plug locks into place.



4. Ground the mounting plate.



5. Check the installation.

☑ The grid connection has been established.

7.4 Connect solar modules

DANGER

Risk of death or serious injury from electrocution

Potentially fatal voltage may be applied to the DC connections of the solar power inverter.

- ► Never disconnect the solar modules when the solar power inverter is under load. First switch off the grid connection so the solar power inverter cannot feed energy into the grid. Then open the DC isolating switch.
- ► Make sure the DC connections cannot be accidentally touched.

NOTE

To ensure protection conforming to IP65 all unused connections and interfaces must be closed using the covers on the connections.

7.4.1 General Instructions

The strings of the solar modules are connected to the DC connections, see Fig. 7.6, p. 31.

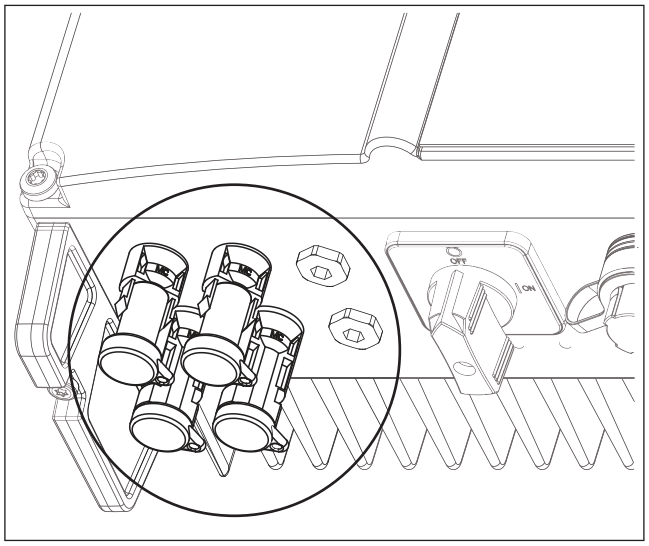


Fig. 7.6: Location of DC connections

The negative DC pole of the string is connected to the DC-MINUS connection; the positive DC pole to the DC-PLUS connection, see Fig. 7.7, p. 31.

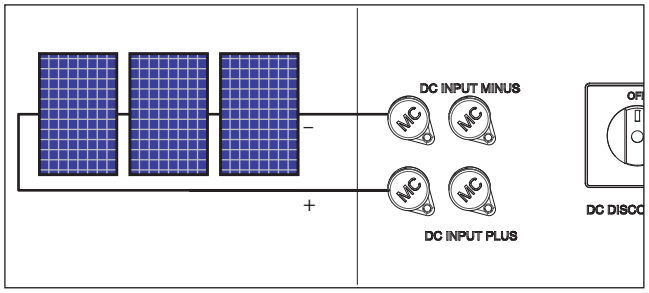


Fig. 7.7: Connecting solar modules to DC connections

Pay attention to the maximum input voltage of the solar power inverter and the maximum allowed current load of the DC connections (see Chapter ”15 Technical data”, p. 87).

The DC-MINUS connection is a socket. A connection plug is required for the DC-cable.

The DC-PLUS connection is a plug. A connection socket is required for the DC-cable.

7.4.2 Required Tools and Accessories

Not included in delivery:

Single-core cable

Grounding kit

The grounding kit is required when the DC-PLUS or DC-MINUS side of the solar power inverter must be grounded.

The grounding kit can be ordered from Delta. A manual is enclosed and can be downloaded at www.solar-inverter.com.

Grounding kit	Delta Part Number
SOLIVIA EU G4 TR grounding kit	EOE990000275

Connection Socket and Connection Plug

DC Connection Type on Solar Power Inverter	Counterpiece Required for Cable
The DC-MINUS connection is a socket.	A connection plug is required for the DC cable.
The DC-PLUS connection is a plug.	A connection socket is required for the DC cable.

Connection sockets and connection plugs can be ordered from Multi-Contact at www.multi-contact.de. The required size depends on the wire cross-section and thickness of the cable used.

You can also download the manual from the Multi-Contact website. This manual will also tell you which tools are required.

DC Connection of Power Inverter	Connection Type for Cable	Wire Cross-Section mm²	Wire Cross-Section AWG	Diameter Range for Cable Sheath mm	Multi-Contact Order No.
DC+	Socket	1.5/2.5	14	3-6	32.0010P0001-UR
				5.5-9	32.0012P0001-UR
		4/6	10	3–6	32.0014P0001-UR
				5.5-9	32.0016P0001-UR
DC-	Plug	1.5/2.5	14	3-6	32.0011P0001-UR
				5.5-9	32.0013P0001-UR
		4/6	10	3-6	32.0015P0001-UR
				5.5-9	32.0017P0001-UR

Multi-Contact UTE kit (for France)

The Multi-Contact UTE Kit is designed to conform to the latest French standard UTE C 15-712-1. It contains eight couplings, an installation and removal key and a signal sticker. This kit allow you to meet the DC protection and signal requirements specified in UTE C 15-712-1.

Multi-Contact UTE Kit	Delta Part Number
Multi-Contact UTE kit for SOLIVIA EU G4 TR	EOE90000341

7.4.3 Establishing Connection

1. Check the polarity of the DC voltage at the DC connections before connecting the solar modules.
2. Install the connection plug/socket on the DC cable. Follow the instructions in the connection plug manual.
3. Insert the DC cable into the DC connections for the solar power inverter.
4. Check the installation.

☑ The solar modules are now connected.

7.4.4 Grounding DC Side

The solar power inverter can be grounded at either the DC+ side or the DC- side. The ground connection must be installed near the solar power inverter. We recommend using the grounding kit from Delta.

The DC side of the solar power inverter has an insulation and grounding monitor. Monitoring can be configured in the **230 Grounding** menu, see “10.13 Insulation and grounding monitoring”, p. 67.

► Install the ground kit according to the manual delivered with the kit.

7.5 Connect RS485 (EIA485) - optional

ATTENTION

To ensure IP65 protection, all unused connections and interfaces must be closed using the covers on the solar power inverter.

Only the cables described below may be used. Standard cables are not permitted.

7.5.1 General Instructions

One or more solar power inverters can be connected to a monitoring system using the RS485 interfaces (see Fig. 7.8, p. 32).

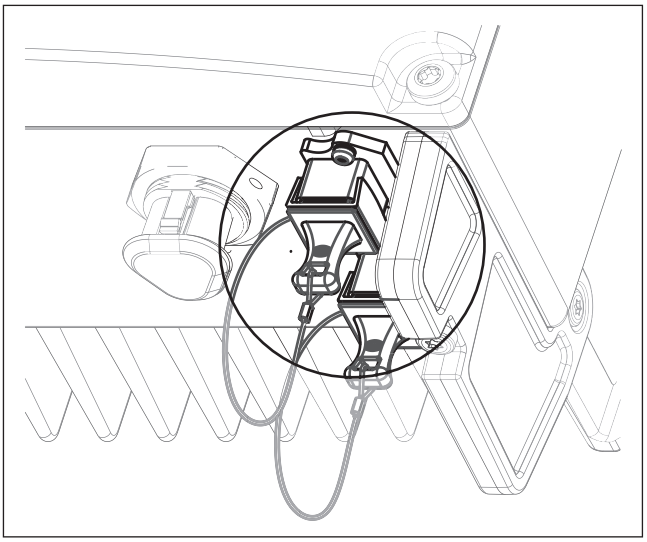


Fig. 7.8: Location of RS485 connection

The two RS485 interfaces are internally wired 1:1. Each RS485 interface can be used as an input or output.

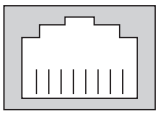
If multiple solar power inverters are connected to a computer using the RS485, a separate RS485 ID must be configured for each solar power inverter.

The RS485 ID (identifier = unique ID) is used for unique identification of every solar power inverter in the system. If one and the same RS485-ID is configured for several solar power invertors, only one of them is recognized.

The RS485 ID can be set during commissioning (see “8 Commissioning”, p. 36) and during ongoing operation (see “10.6 RS485 (EIA485) Settings”, p. 60).

A RS485 terminating connector must be connected to the last solar power inverter, see Fig. 7.10, p. 33. The RS485 terminating connector is required to ensure failure-free signal transfer.

Pin Assignments



Pin	Assignment
1	Reserved
2	Reserved
3	Reserved
4	GND
5	Reserved
6	Reserved
7	TX_A
8	RX_B

7.5.2 Required Tools and Accessories

Not included in delivery:

Connection cable from solar power inverter to monitoring device

Connection cable from solar power inverter to solar power inverter

RS485 terminating connector

You can order the required accessories from Delta:

Accessories	Delta Part Number
Connection cable from solar power inverter to solar power inverter (Push/pull cable by Harting; IP67; RJ45 terminating connector on both sides, one side with blue cable manager, other side with white cable manager)	
1.5 m	3081186300
3.0 m	3081186500
5.0 m	3081186600
10.0 m	3081186200
20.0 m	3081186400
Connection cable from solar power inverter to monitoring device (e.g. Solivia Gateway M1 G2, Solarlog or Meteocontrol WEB'logger)	
Cable from Harting; IP65; one side with RJ45 push/pull connector (IP65) for connection to solar power inverter, other side with RJ12 connector (IP20) for connection with monitoring system	3081129500
RS485 terminating connector G4RT	3072438891

If you wish to assemble the connection cables yourself, then you must use cable managers from Harting (IP67-Push/Pull system cable RJ45).

We recommend using a blue cable manager on one side and a white cable manager on the other side.

Accessories	Harting Part No.
Cable manager	
RJI IP67 data plug PushPull 8-pin white	09 45 145 1500
RJI IP67 data plug PushPull 8-pin blue	09 45 145 1510

HARTING Deutschland GmbH & Co. KG (PF 2451, D-32381 Minden, www.harting.com)

7.5.3 Connecting Individual Solar Power Inverters

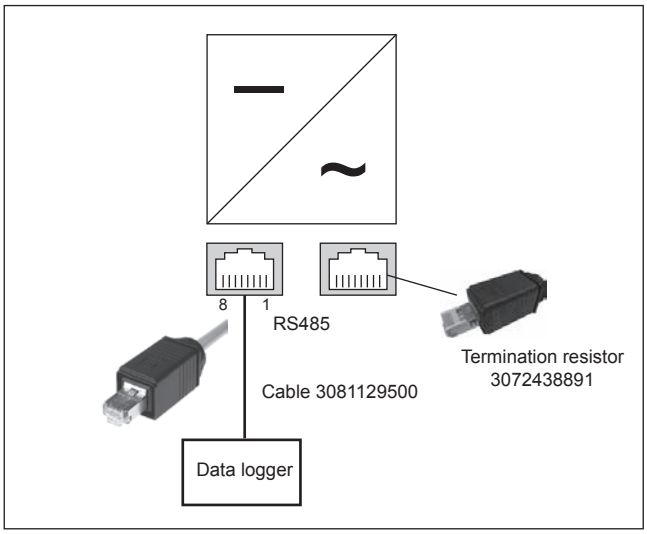


Fig. 7.9: Connection of a single solar power inverter to a data logger via RS485

7.5.4 Connecting Multiple Solar Power Inverters

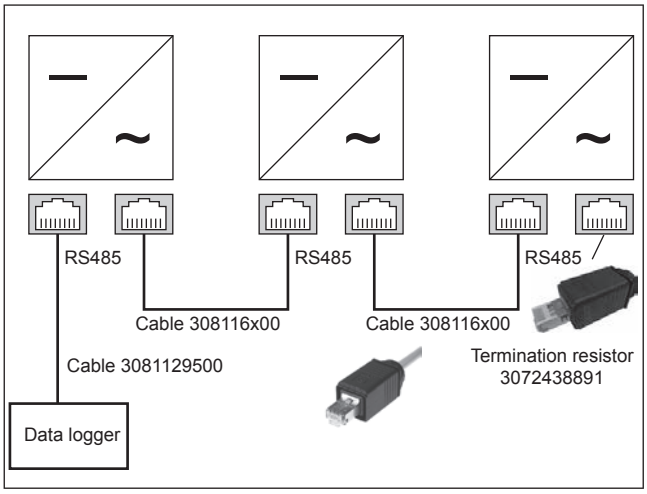


Fig. 7.10: Connection of multiple solar power inverters to a data logger via RS485

EN

7.6 Install USB card (only for Italy and PV systems equal to or less than 6 kW)

To meet the requirements of CEI 021:2012-12, a special USB card is required for the operation of the solar power inverter in PV systems equal to or less than 6 kW.

The USB card can be used to receive the signals "Teledistacco" and "Segnale esterne".

You also require the SOLIVIA cable kit IP65 as a strain relief for the signal cable and to ensure a level of protection of maximum IP65.

The USB card and the SOLIVIA cable kit are not included in the delivery scope of the solar power inverter and must be ordered at Delta.

7.6.1 Required Tools and Accessories

Not included in delivery:

USB I card

SOLIVIA cable kit IP65

Signal cable, 4-core

Flat nose pliers Needed to extract the USB card installed in the factory to the solar power inverter.

Accessories	Delta Part Number
SOLIVIA USB/I card	EOE90000484
SOLIVIA cable kit IP65	EOE90000481

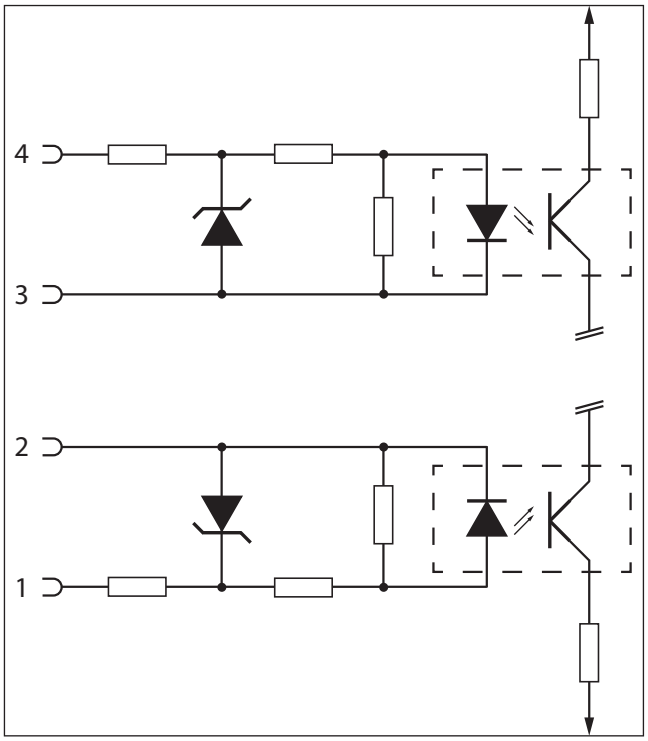
7.6.2 Pin Assignments

Pin	Designation	Use
1	1 HIGH	Segnale esterne
2	1 LOW	GND Pin 1
3	2 LOW	GND Pin 4
4	2 HIGH	Teledistacco

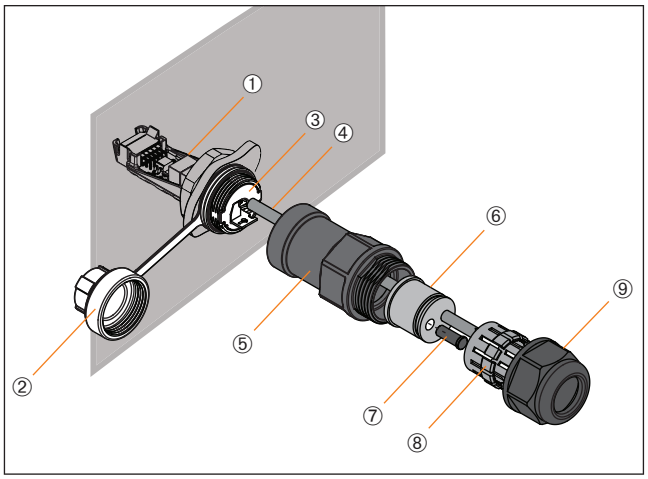
7.6.3 Signal level

LOW	0 .. 5 V DC
HIGH	12/24 V DC
	Voltage range: 10 .. 30 V DC

7.6.4 Connection schema



7.6.5 Overview of mounting parts

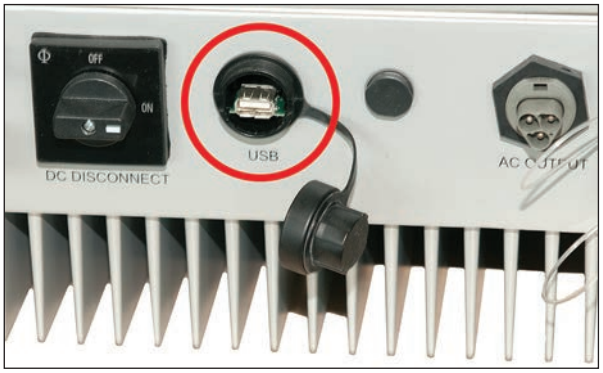


No.	Designation
①	USB/I card
②	Cover
③	Cover panel
④	Signal cable
⑤	Plug housing
⑥	Cable entry sealing ring
⑦	Seal for unused openings
⑧	Clamping cage
⑨	Screw fitting

7.6.6 Exchange USB card

1. Push the parts of the cover out of the SOLIVIA cable in the specified sequence via the signal cable. Close the unused aperture of the sealing ring with one of the seals from the SOLIVIA cable kit.

2. Attach the signal cable using the pin assignment to the USB/I card.
3. Unscrew the cover from the USB connection.



4. Use the two pliers from the SOLIVIA cable kit to extract the small cover panel from the USB connection.

5. Use wide flat-nosed pliers to remove the contained USB card from the socket.

6. Insert the USB/I card into the socket so that the signal cable is at the top

7. With your fingers, carefully push the USB/I card home into the socket.

8. Connect the small cover panel from the SOLIVIA cable kit to the USB connection.
9. Screw the connection to the USB connection.

8. Commissioning

8.1 Before You Begin

The solar power inverter must be correctly installed, see “7 Installation”, p. 24.

Information on operating the display is provided in “5.4 Display and Buttons”, p. 14.

NOTE

As long as the commissioning procedure has not been completed, you can go back to any point in the commissioning procedure at any time by pressing the ESC button.

NOTE

Always read through each step before starting the commissioning procedure.

The display images in this chapter are examples and do not necessarily represent the settings needed for your own installation. Therefore, always check the settings.

8.2 Brief description of the commissioning steps

The table contains a brief description of all commissioning steps. Please note that not all commissioning steps apply for every country.

Commissioning step	Description	Valid for country
Set the display language	Select the desired display language.	All
Load USB data	Optional. You can load the settings from other power invertors of the same type.	All
Grid selection	The most important commissioning step! The grids are sorted by country. For some countries, several grids are available and are listed separately. Make sure you select the right country/grid.	All
PDD settings	Settings for the internal grid and system protection (formerly known as ENS) based on VDE-AR-N 4105 (for low voltage grids) or BDEW (for medium voltage grids). The settings you make here depend on how the PV system is connected to the grid supply. If in doubt, as your energy provider.	Denmark, Germany
Blocked power limitation	In some cases, energy providers demand a limit to active or apparent power. For example, in Germany, a limitation of the active power of 70% can be demanded; or the system must not exceed a maximum asymmetric grid load. You normally do not need to change the default values, however.	All
SPI CEI 021	After consulting with your energy provider, this is where you can change the settings based on the Italian norm SPI CEI 0-21:2012-12.	Italy
Display format for date and time	Select the required display format.	All
Date and time	Configure the date and time correctly to ensure that the statistics are displayed correctly.	All
Settings for RS485	When you connect the solar power inverter to a monitoring system, you can change the standard settings for the RS485 interface in this step.	All

8.3 Selecting the Correct Commissioning Procedure

The solar power inverter must be newly installed:

Country	Grid (as shown on display)	Description	Applicable Commissioning Procedure
Belgium	BE C10/11 12	Belgium as per C10/11, Issue 2012	"8.4 Commissioning for grids as per EN 50438 and VDE 0126", p. 38
Bulgaria	BG	Bulgaria	
Germany	DE LVD	Germany as per VDE AR N 4105	"8.5 Commissioning for VDE AR N 4105 grids", p. 41
Denmark	DK LVD	Denmark as per VDE AR N 4105	
France	FR UTE	France as per UTE	
	FR ISL. 60Hz	France/islands 60 Hz	
	FR VFR 2013	VFR 2013	"8.4 Commissioning for grids as per EN 50438 and VDE 0126", p. 38
	FR VFR 2014	VFR 2014	
Greece	GR CONTINENT	Greece/continent (49.5/50.5 Hz)	
	GR ISLAND	Greece/islands (47.5/51 Hz)	
Italy	IT BT 21	Italy as per CEI 0-21:2012-12 for PV systems equal to or less than 6 kW.	"8.6 Commissioning in Italy for PV Systems Below 6 kW", p. 44
	IT BT 21 > 6kW	Italy as per CEI 0-21:2012-12 for PV systems greater than 6 kW.	
Spain	ES RD1699	Spain as per RD 1699	
	ES RD661	Spain as per RD 661	
	ES ISLAND	Spain/islands	
Netherlands	NL	Netherlands	
Poland	PL	Poland	"8.4 Commissioning for grids as per EN 50438 and VDE 0126", p. 38
Portugal	PT	Portugal	
Romania	RO	Romania	
Slovakia	SK	Slovakia	
Czech Republic	CZ	Czech Republic	
United Kingdom	UK G59-2 230	United Kingdom as per G59-2 230 V and 240 V	
	UK G59-2 240		
	UK G83-1	United Kingdom as per G83-1	

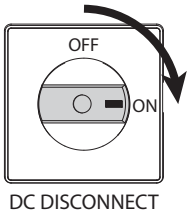
The solar power inverter must be set up with the same settings as another identical solar power inverter.	"8.7 Commissioning by loading the settings from another solar power inverter", p. 48
The solar power inverter is a replacement device for another identical solar power inverter.	"8.8 Commissioning after replacing a solar power inverter", p. 51
The solar power inverter should be newly set up and the grid to which the solar power inverter is connected is **not** shown in the list above.	You can set up a customer-specific grid. Please contact Delta Support by phone.

8.4 Commissioning for grids as per EN 50438 and VDE 0126

The standard commissioning is valid for the following countries and grids.

Country	Grid	Notes
Belgium	BE C10/11 12	
Bulgaria	BG	
France	FR UTE	France as per UTE
	FR ISL. 60Hz	France/islands 60 Hz
	FR VFR 2013	VFR 2013
	FR VFR 2014	VFR 2014
Greece	GR and GR ISLAND	
Italy	IT BT 21 > 6kW	As per CEI 0-21:2012-12 for PV systems greater than 6 kW.
Netherlands	NL	
Portugal	PT	
Poland	PL	
Romania	RO	
Slovakia	SK	
Spain	ES ISLAND, ES RD661 and ES RD1699	
Czech Republic	CZ	
United Kingdom	UK G59-2 230	for 230-V grids
	UK G59-2 240	for 240-V grids
	UK G83-1	

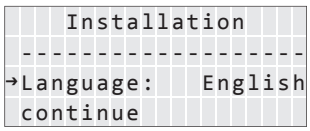
1. Check all connections and cables for damage and correct seating. Correct the installation if necessary.



2. Switch on the DC isolating switch.

   → The startup process of the solar power inverter will begin.

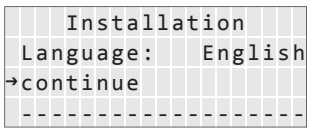
   After the startup process and the automatic self-test, the commissioning procedure of the inverter starts and the **Installation** menu is displayed.



3. To change the language, press the ↵ button and then set the language using the ↓↑ buttons. Press the ↵ button to apply the language.

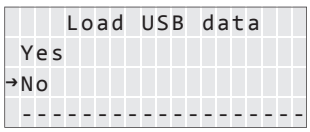
Available languages:

Czech | Danish | Dutch | English | French | German | Italian | Polish | Portuguese | Romanian | Slovak | Slovenian | Spanish



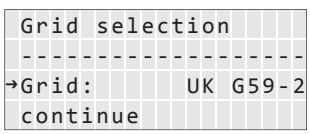
4. Press the ↓↑ buttons to select ***continue*** and then press the ↵ button.

   → This displays the **Load USB Data** menu.



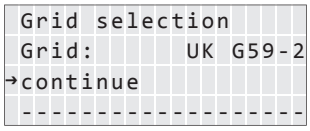
5. Press the ↓↑ buttons to select ***No*** and then press the ↵ button.

   → The **Grid selection** menu is displayed.



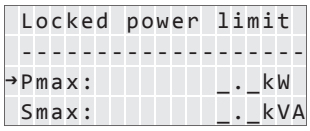
6. To change the grid, press the ↵ button and then set the grid using the ↓↑ buttons. Press the ↵ button to apply the grid.

NOTE: This is where you can select the right grid for your country.



7. Press the ↓ ↑ buttons to select ***continue*** and then press the ↵ button.

   → The **Locked power limit** menu is displayed.

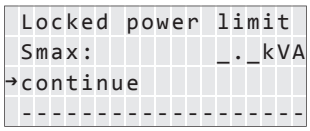


8. To change the value, press the ↵ button and then set the value using the ↓ ↑ buttons. Press the ↵ button to apply the value.

NOTE: If you change one of the values, you must fill out the provided label after commissioning and place it next to the type plate.

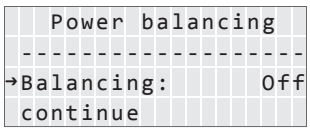
NOTE: The configured values can only be changed after commissioning with a PIN.

NOTE: The configured values are displayed after commissioning in the **131 View Grid Setup** menu.



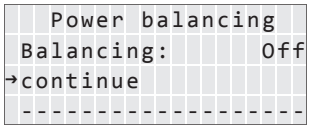
9. Press the ↓ ↑ buttons to select ***continue*** and then press the ↵ button.

   → The **Power Balancing** menu is displayed.



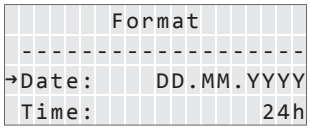
10. To change the settings, press the ↵ button and then select the option using the ↓ ↑ buttons. Press the ↵ button to apply the setting.

NOTE: The grid load can only be balanced with a SOLIVIA Gateway M1 G2. If no gateway is connected, the ***Balance*** option will always be set to ***Off***. Otherwise the solar power inverter will not feed into the grid.



11. Press the buttons ↓ ↑ to select ***continue*** and then press the ↵ button.

    → The **Format** menu is displayed.



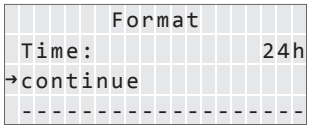
12. To change the value, press the ↵ button and then set the value using the ↓ ↑ buttons. Press the ↵ button to apply the value.

Available date formats:

DD.MM.YYYY | DD/MM/YYYY
DD-MM-YYYY | MM.DD.YYYY
MM/DD/YYYY | MM-DD-YYYY
YYYY.MM.DD| YYYY/MM/DD
YYYY-MM-DD

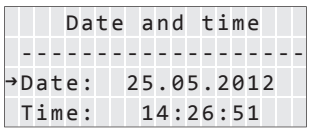
Available time formats:

12h | 24h

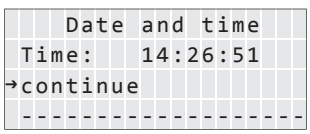


13. Press the ↓ ↑ buttons to select ***continue*** and then press the ↵ button.

    → The **Date and Time** menu is displayed.

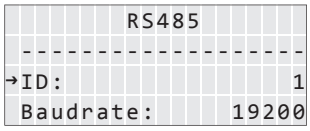


14. To change the value, press the ↵ button and then set the value using the ↓ ↑ buttons. Press the ↵ button to apply the value.



15. Press the ↓ ↑ buttons to select ***continue*** and then press the ↵ button.

    → The **RS485** menu is displayed.



16. To change the value, press the ↵ button and then set the value using the ↓↑ buttons. Press the ↵ button to apply the value.

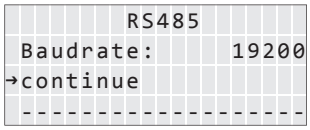
NOTE: If multiple solar power inverters are to be connected via RS485, select a different ID for each inverter. The ID is also used when saving and loading settings in order to identify the solar power inverter.

Available IDs:

1 ... 254

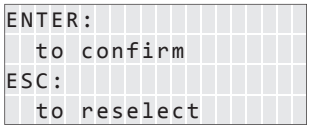
Available baudrates:

2400 | 4800 | 9600 | 19200 | 38400



17. Press the ↓↑ buttons to select ***continue*** and then press the ↵ button.

    → The completion screen will be displayed.



18. Press the ↵ button to complete commissioning.

    or

    Press the ↵ button to change settings.

☑ Commissioning is now finished.

NOTE

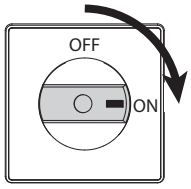
- The solar power inverter offers some optional functions available for all grids, see “10 Settings”, p. 58.
- On completion of commissioning, save the settings (see “11.5 Saving settings”, p. 72) and the swap data (see “11.7 Saving swap data”, p. 74) on a USB stick so that you can use this information later.

8.5 Commissioning for VDE AR N 4105 grids

The commissioning for VDE AR N 4105 grids is valid for the following countries and grids.

Country	Grid	Notes
Denmark	DK LVD	
Germany	DE LVD	

1. Check all connections and cables for damage and correct seating. Correct the installation if necessary.

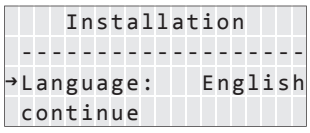


DC DISCONNECT

2. Switch on the DC isolating switch.

   → The startup process of the solar power inverter will begin.

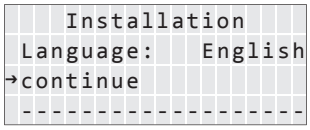
   After the startup process and the automatic self-test, the commissioning procedure of the inverter starts and the **Installation** menu is displayed.



3. To change the language, press the ↵ button and then set the language using the ↓↑ buttons. Press the ↵ button to apply the language.

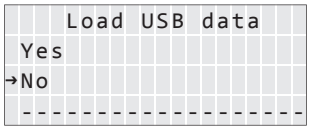
Available languages:

Czech | Danish | Dutch | English | French | German | Italian | Polish | Portuguese | Romanian | Slovak | Slovenian | Spanish



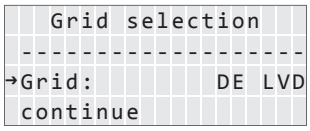
4. Press the ↓↑ buttons to select ***continue*** and then press the ↵ button.

   → This displays the **Load USB Data** menu.



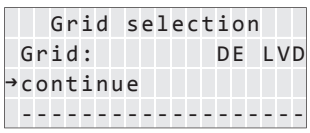
5. Press the ↓↑ buttons to select ***No*** and then press the ↵ button.

   → The **Grid Selection** menu is displayed.



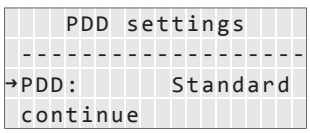
6. To change the grid, press the ↵ button and then set the grid using the ↓↑ buttons. Press the ↵ button to apply the grid.

NOTE: This is where you can select the right grid for your country.



7. Press the ↓↑ buttons to select ***continue*** and then press the ↵ button.

   → The **PDD Settings** (settings for grid and system protection) will be displayed.



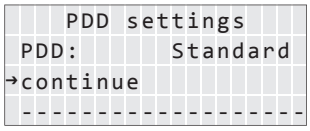
8. To change the settings for the grid and system protection, press the ↵ button and then set the option using the ↓ ↑ buttons. Press the ↵ button to apply the setting.

Available options:

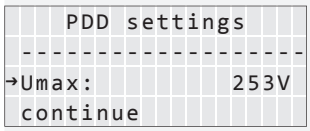
`Standard`: Loads the settings defined by the VDE AR N 4105 standard.

`Off`: Grid and system protection is deactivated.

`User`: The parameters can be manually configured within the limits defined by the VDE AR N 4105 standard.



9. Press the ↓ ↑ buttons to select ***continue*** and then press the ↵ button.
   → If the PDD setting is ***User***, an extended **PDD Settings** menu will be displayed. Continue with Step 10.
   → If the PDD setting is ***Standard*** or ***Off***, the **Locked Power Limit** menu will be displayed. Continue with Step 12.

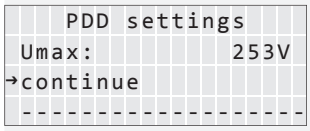


10. To change the value, press the ↵ button and then set the value using the ↓ ↑ buttons. Press the ↵ button to apply the value.

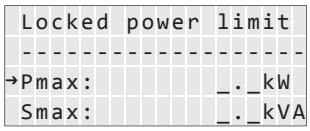
NOTE: Steps 10 and 11 are only necessary when the mode ***User*** was set in Step 9.

Available Umax settings:

253 ... 264 V (corresponds to 110 - 115% of 230 V), default is 253 V.



11. Press the ↓ ↑ buttons to select ***continue*** and then press the ↵ button.
   → The **Locked power limit** menu is displayed.

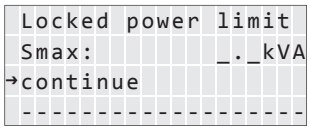


12. To change a value, press the ↵ button and then set the value using the ↓ ↑ buttons. Press the ↵ button to apply the value.

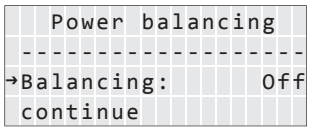
NOTE: If you change one of the values, you must fill out the provided label after commissioning and place it next to the type plate.

NOTE: The configured values can only be changed after commissioning with a PIN.

NOTE: The configured values are displayed after commissioning in the 131 View Grid Setup menu.

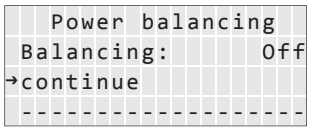


13. Press the ↓ ↑ buttons to select ***continue*** and then press the ↵ button.
   → The **Power Balancing** menu is displayed.

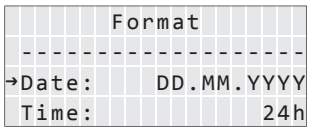


14. To change the settings, press the ↵ button and then select the option using the ↓ ↑ buttons. Press the ↵ button to apply the setting.

NOTE: The grid load can only be balanced with a SOLIVIA Gateway M1 G2. If no gateway is connected, the ***Balance*** option will always be set to ***Off***. Otherwise the solar power inverter will not feed into the grid.



15. Press the ↓ ↑ buttons to select ***continue*** and then press the ↵ button.
   → The **Format** menu is displayed.



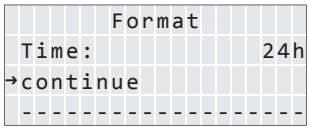
16. To change the value, press the ↵ button and then set the value using the ↓ ↑ buttons. Press the ↵ button to apply the value.

Available date formats:

DD.MM.YYYY | DD/MM/YYYY
DD-MM-YYYY | MM.DD.YYYY
MM/DD/YYYY | MM-DD-YYYY
YYYY.MM.DD| YYYY/MM/DD
YYYY-MM-DD

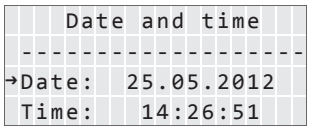
Available time formats:

12h | 24h

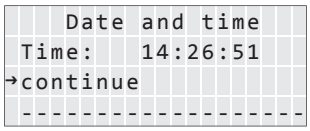


17. Press the ↓ ↑ buttons to select ***continue*** and then press the ↵ button.

    → The **Date and Time** menu is displayed.

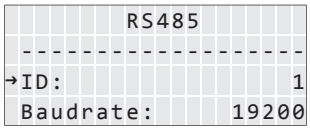


18. To change the value, press the ↵ button and then set the value using the ↓ ↑ buttons. Press the ↵ button to apply the value.



19. Press the ↓ ↑ buttons to select ***continue*** and then press the ↵ button.

    → The **RS485** menu is displayed.



20. To change the value, press the ↵ button and then set the value using the ↓ ↑ buttons. Press the ↵ button to apply the value.

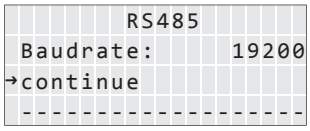
NOTE: If multiple solar power inverters are to be connected via RS485, select a different ID for each inverter. The ID is also used when saving and loading settings in order to identify the solar power inverter.

Available IDs:

1 ... 254

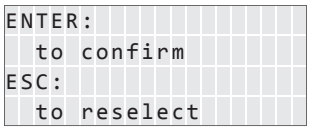
Available baudrates:

2400 | 4800 | 9600 | 19200 | 38400



21. Press the ↓ ↑ buttons to select ***continue*** and then press the ↵ button.

    → The completion screen will be displayed.



22. Press the ↵ button to complete commissioning.

    or

    Press the ↵ button to change settings.

☑ Commissioning is now finished.

NOTE

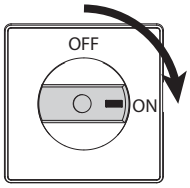
- If the solar power inverter is configured to the DE LVD or DK LVD grids, you can also configure active and reactive power control, see “10.9 Active power control”, p. 62 and “10.10 Reactive Power Control”, p. 64.
- The solar power inverter offers some optional functions available for all grids, see “10 Settings”, p. 58.
- On completion of commissioning, save the settings (see “11.5 Saving settings”, p. 72) and the swap data (see “11.7 Saving swap data”, p. 74) on a USB stick so that you can use this information later.

8.6 Commissioning in Italy for PV Systems Below 6 kW

The standard commissioning is valid for the following countries and grids.

Country	Grid	Notes
Italy	IT BT 21	As per CEI 0-21:2012-12 for PV systems equal to or less than 6 kW.

1. Check all connections and cables for damage and correct seating. Correct the installation if necessary.

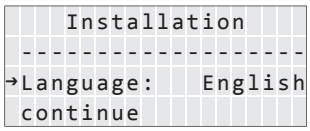


DC DISCONNECT

2. Switch on the DC isolating switch.

   → The startup process of the solar power inverter will begin.

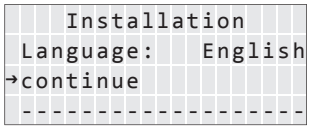
   After the startup process and the automatic self-test, the commissioning procedure of the inverter starts and the **Installation** menu is displayed.



3. To change the language, press the ↵ button and then set the language using the ↓ ↑ buttons. Press the ↵ button to apply the language.

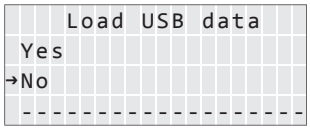
Available languages:

Czech | Danish | Dutch | English | French | German | Italian | Polish | Portuguese | Romanian | Slovak | Slovenian | Spanish



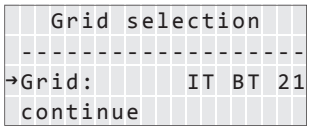
4. Press the ↓ ↑ buttons to select ***continue*** and then press the ↵ button.

   → This displays the **Load USB Data** menu.

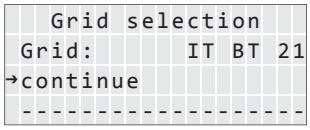


5. Press the ↓ ↑ buttons to select ***No*** and then press the ↵ button.

   → The **Grid Selection** menu is displayed.

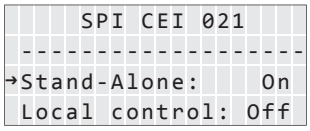


6. To change the grid, press the ↵ button and use the ↓ ↑ buttons to set the grid to IT BT 21. Press the ↵ button to apply the grid.



7. Press the ↓ ↑ buttons to select ***continue*** and then press the ↵ button.

   → The **SPI CEI 021** menu is displayed.

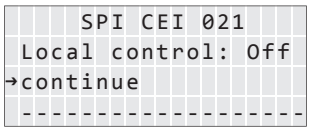


8. To change the settings, press the ↵ button and then set the option using the ↓↑ buttons. Press the ↵ button to apply the setting.

NOTE: Make sure you clarify with your energy provider which settings must be made.

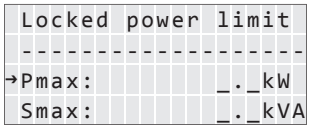
The settings for the parameters ***Stand-alone*** and ***Local control*** have the following effects:

Stand-alone	Local control	Description
ON	ON	Parameters 81>S1 and 81<S1 (= narrow frequencies) are activated. The USB ports are deactivated (i.e. **no** external signals can be received via the USB interface).
ON	OFF	Parameters 81>S1 and 81<S1 (= narrow frequencies) are activated. The setting can be changed via the signal "Segnale esterno". The USB ports are activated (i.e. external signals can be received via the USB interface). If the signal "Teledistacco" is entered for pin 4, then the solar power inverter switches off. As long as the signal "Segnale esterno" is entered for pin 1, the parameters 81>S1 and 81<S1 (= narrow frequencies) are activated, otherwise parameters 81>S1 and 81<S1 are deactivated.
OFF	ON	Parameters 81>S1 and 81<S1 (= narrow frequencies) are deactivated. The USB ports are deactivated (i.e. **no** external signals can be received via the USB interface).
OFF	OFF	Parameters 81>S1 and 81<S1 (= narrow frequencies) are deactivated. The USB ports are activated (i.e. external signals can be received via the USB interface). If the signal "Teledistacco" is entered for pin 4, then the solar power inverter switches off. The signal "Segnale esterno" has no effect, as the parameters 81>S1 and 81<S1 are already deactivated via Local Control = OFF.



9. Press the ↓↑ buttons to select ***continue*** and then press the ↵ button.

   → The **Locked power limit** menu is displayed.

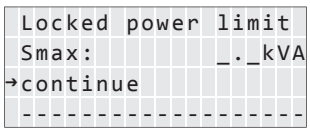


10. To change the value, press the ↵ button and then set the value using the ↓↑ buttons. Press the ↵ button to apply the value.

NOTE: If you change one of the values, you must fill out the provided label after commissioning and place it next to the type plate.

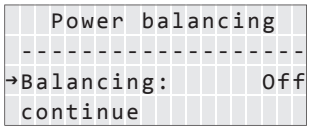
NOTE: The configured values can only be changed after commissioning with a PIN.

NOTE: The configured values are displayed after commissioning in the 131 View Grid Setup menu.



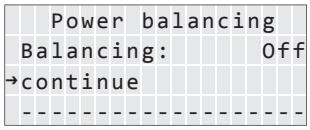
11. Press the ↓↑ buttons to select ***continue*** and then press the ↵ button.

    → The **Power Balancing** menu is displayed.



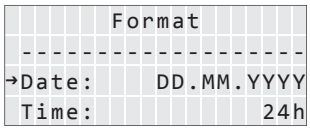
12. To change the settings, press the ↵ button and then select the option using the ↓↑ buttons. Press the ↵ button to apply the setting.

NOTE: The grid load can only be balanced with a SOLIVIA Gateway M1 G2. If no gateway is connected, the ***Balance*** option will always be set to ***Off***. Otherwise the solar power inverter will not feed into the grid.



13. Press the buttons ↓↑ to select ***continue*** and then press the ↵ button.

    → The **Format** menu is displayed.



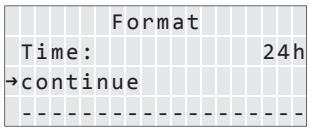
14. To change the value, press the ↵ button and then set the value using the ↓↑ buttons. Press the ↵ button to apply the value.

Available date formats:

DD.MM.YYYY | DD/MM/YYYY
DD-MM-YYYY | MM.DD.YYYY
MM/DD/YYYY | MM-DD-YYYY
YYYY.MM.DD| YYYY/MM/DD
YYYY-MM-DD

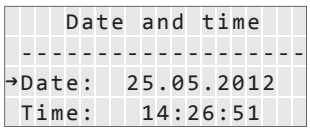
Available time formats:

12h | 24h

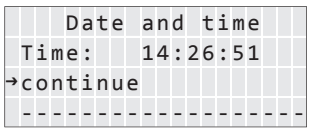


15. Press the ↓↑ buttons to select ***continue*** and then press the ↵ button.

    → The **Date and Time** menu is displayed.

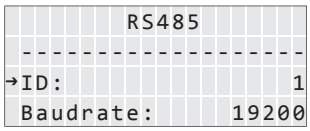


16. To change the value, press the ↵ button and then set the value using the ↓↑ buttons. Press the ↵ button to apply the value.



17. Press the ↓↑ buttons to select ***continue*** and then press the ↵ button.

    → The **RS485** menu is displayed.



18. To change the value, press the ↵ button and then set the value using the ↓↑ buttons. Press the ↵ button to apply the value.

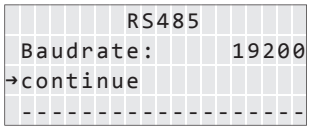
NOTE: If multiple solar power inverters are to be connected via RS485, select a different ID for each inverter. The ID is also used when saving and loading settings in order to identify the solar power inverter.

Available IDs:

1 ... 254

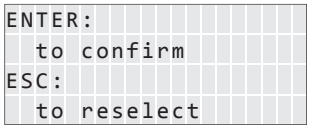
Available baudrates:

2400 | 4800 | 9600 | 19200 | 38400



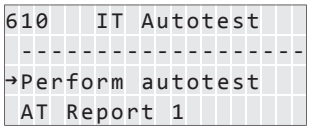
19. Press the ↓↑ buttons to select ***continue*** and then press the ↵ button.

    → The completion screen will be displayed.



20. Press the ↵ button.

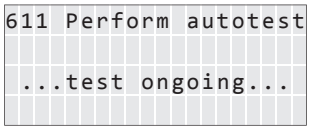
    → The **610 IT Autotest** (Italy autotest) menu is displayed.



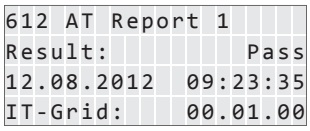
21. Select ***Perform autotest*** using the ↓↑ buttons, then press the ↵ button to perform the autotest.

    → The autotest starts.

NOTE: For PV systems greater than 6 kW, an autotest is not required by CEI 0-21:2012-06. For this reason, the menu will not be displayed when the `IT BT 21 > 6kW` grid is selected.



22. The Autotest checks the proper operation of the grid and system protection.



23. The test result is displayed after the autotest is completed.

☑ If the autotest is successful, commissioning is complete.

NOTE: The solar power inverter may only be put into operation when the overall test result of the last autotest is **Pass**. The reports for the last five autotests are saved.

NOTE: See Chapter “12.6 Autotest for Italy”, p. 84 for more detailed information on the autotest.

NOTE

- The solar power inverter offers some optional functions available for all grids, see “10 Settings”, p. 58.
- On completion of commissioning, save the settings (see “11.5 Saving settings”, p. 72) and the swap data (see “11.7 Saving swap data”, p. 74) on a USB stick so that you can use this information later.

8.7 Commissioning by loading the settings from another solar power inverter

It is possible in all countries and for all grids to load the settings from another solar power inverter.

ATTENTION

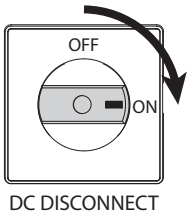
The IP 65 degree of protection is no longer guaranteed when the USB interface protective cover is removed.

- ► Only remove the protective cover when necessary.
- ► Where possible, use a Micro-USB stick. The protective cover is designed to be screwed down over a Micro-USB stick.

1. If you have not already done so, save the settings of the other solar power inverter to a USB drive, see "11.5 Saving settings", p. 72.

NOTE: The STUP_###.CFG file must be in the main directory of the USB drive. The ### characters represent the RS485 ID of the solar power inverter from which the data is to be loaded, for example "001".

2. Check all connections and cables for damage and correct seating. Correct the installation if necessary.



DC DISCONNECT

3. Switch on the DC isolating switch.

   → The startup process of the solar power inverter will begin.

   After the startup process and the automatic self-test, the commissioning procedure of the inverter starts and the **Installation** menu is displayed.

```
    Installation
 --------------------
→Language:   English
 continue
```

4. To change the language, press the ↵ button and then set the language using the ↓↑ buttons. Press the ↵ button to apply the language.

Available languages:

Czech | Danish | Dutch | English | French | German | Italian | Polish | Portuguese | Romanian | Slovak | Slovenian | Spanish

```
    Installation
 Language:   English
→continue
 --------------------
```

5. Press the ↓↑ buttons to select ***continue*** and then press the ↵ button.

   → This displays the **Load USB Data** menu.

```
    Load USB data
 --------------------
→Yes
 No
```

6. Press the ↓↑ buttons to select ***Yes*** and then press the ↵ button.

```
    Load USB data


Insert USB Pendrive
   and press ENTER
```

7. Insert USB Pendrive and press ↵.

NOTE: The STUP_###.CFG file must be in the main directory of the USB drive. The ### characters represent the RS485 ID of the solar power inverter from which the data is to be loaded, for example "001".

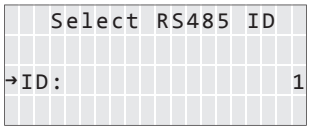
```
    Load USB data
 --------------------
→Load settings
 Load swap data
```

8. Press the ↓↑ buttons to select ***Load Settings*** and then press the ↵ button.

   → The solar power inverter will then search for files on the USB drive.

   When files are found, the **Select RS485 ID** menu is displayed.

NOTE: If the message `No files found` is displayed, make sure the files are in the main directory of the USB drive.

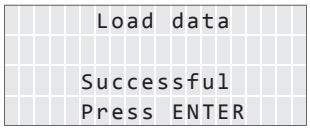


9. Press the ↓ ↑ buttons to select the ***ID*** and then press the ↵ button.

   → The data is then verified and loaded.

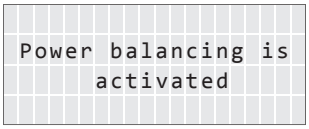
   A message is displayed when the loading process is successful.

NOTE: If the message `Pendrive error` is displayed, make sure the USB drive is properly inserted or that the file is not damaged.

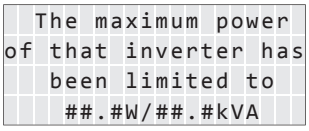


10. Press the ↵ button to confirm.

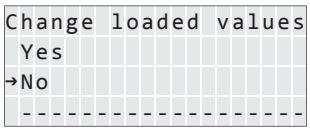
    → If the asymmetrical grid load balancing was activated on the solar power inverter from which the data was loaded, the following message appears.



    → If active or apparent power limitation was activated on the solar power inverter from which the data was loaded, the following message appears.



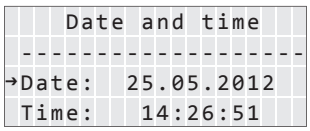
11. If the above mentioned messages appear, press the ↵ button to confirm each.



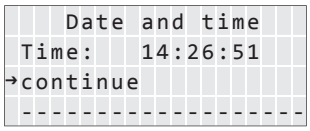
12. Press the ↓ ↑ buttons to select ***No*** and then press the ↵ button.

    → The **Date and Time** menu is displayed.

NOTE: If you wish to change the loaded values, select Yes. Commissioning then continues with the grid selection and is the same as the initial commissioning.

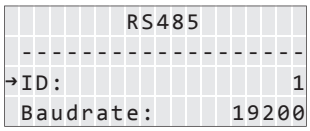


13. To change the value, press the ↵ button and then set the value using the ↓ ↑ buttons. Press the ↵ button to apply the value.



14. Press the ↓ ↑ buttons to select ***continue*** and then press the ↵ button.

    → The **RS485** menu is displayed.



15. To change the value, press the ↵ button and then set the value using the ↓ ↑ buttons. Press the ↵ button to apply the value.

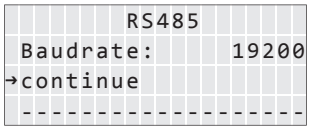
NOTE: If multiple solar power inverters are to be connected via RS485, select a different ID for each inverter. The ID is also used when saving and loading settings in order to identify the solar power inverter.

Available IDs:

1 ... 254

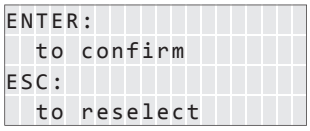
Available baudrates:

2400 | 4800 | 9600 | 19200 | 38400



16. Press the ↓ ↑ buttons to select ***continue*** and then press the ↵ button.

    → The completion screen will be displayed.



17. Press the ↵ button to complete commissioning.

    or

    Press the ↵ button to change settings.

☑ Commissioning is now finished.

NOTE

- If the solar power inverter is configured to the DE LVD or DK LVD grids, you can also configure active and reactive power control, see “10.9 Active power control”, p. 62 and “10.10 Reactive Power Control”, p. 64.
- The solar power inverter offers some optional functions available for all grids, see “10 Settings”, p. 58.
- On completion of commissioning, save the settings (see “11.5 Saving settings”, p. 72) and the swap data (see “11.7 Saving swap data”, p. 74) on a USB stick so that you can use this information later.

8.8 Commissioning after replacing a solar power inverter

It is possible in all countries and for all grids to load the settings from another solar power inverter.

ATTENTION

In this chapter, the term "swap" means the replacement of a damaged solar power inverter with a new device of the same type.

The replacement may only be performed after consulting Delta Solar Support. The support team will discuss the correct procedure with you.

ATTENTION

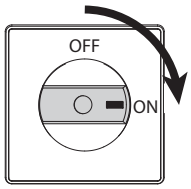
The IP 65 degree of protection is no longer guaranteed when the USB interface protective cover is removed.

- ► Only remove the protective cover when necessary.
- ► Where possible, use a Micro-USB stick. The protective cover is designed to be screwed down over a Micro-USB stick.

1. If you have not already done so, save the settings of the other solar power inverter to a USB drive, see "11.7 Saving swap data", p. 74.

NOTE: The SWAP_###.CFG file must be in the main directory of the USB drive. The ### characters represent the RS485 ID of the solar power inverter from which the data is to be loaded, for example "001".

2. Check all connections and cables for damage and correct seating. Correct the installation if necessary.

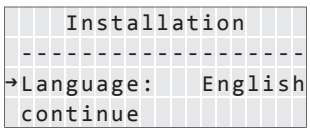


DC DISCONNECT

3. Switch on the DC isolating switch.

   → The startup process of the solar power inverter will begin.

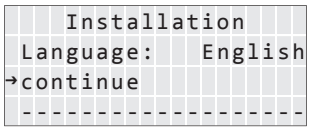
   After the startup process and the automatic self-test, the commissioning procedure of the inverter starts and the **Installation** menu is displayed.



4. To change the language, press the ↵ button and then set the language using the ↓↑ buttons. Press the ↵ button to apply the language.

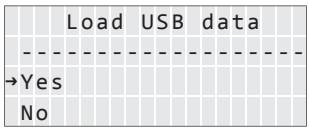
Available languages:

Czech | Danish | Dutch | English | French | German | Italian | Polish | Portuguese | Romanian | Slovak | Slovenian | Spanish

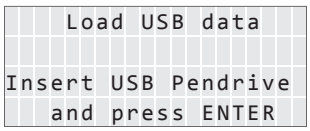


5. Press the ↓↑ buttons to select ***continue*** and then press the ↵ button.

   → This displays the **Load USB Data** menu.

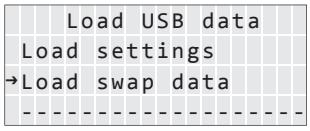


6. Press the ↓↑ buttons to select ***Yes*** and then press the ↵ button.



7. Insert USB Pendrive and press ↵.

NOTE: The STUP_###.CFG file must be in the main directory of the USB drive. The ### characters represent the RS485 ID of the solar power inverter from which the data is to be loaded, for example "001".

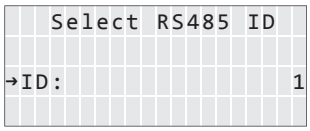


8. Press the ↓ ↑ buttons to select ***Load Swap Data*** and then press the ↵ button.

   → The solar power inverter will then search for files on the USB drive.

   When files are found, the **Select RS485 ID** menu is displayed.

NOTE: If the message `No files found` is displayed, make sure the files are in the main directory of the USB drive.

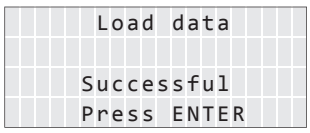


9. Press the ↓ ↑ buttons to select the ***ID*** and then press the ↵ button.

   → The data is then verified and loaded.

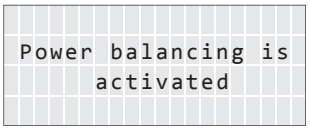
   A message is displayed when the loading process is successful.

NOTE: If the message `Pendrive error` is displayed, make sure the USB drive is properly inserted.

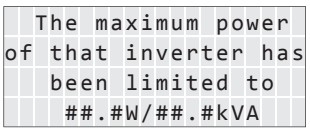


10. Press the ↵ button to confirm.

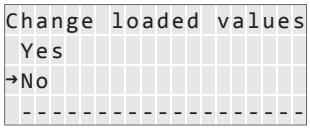
    → If the asymmetrical grid load balancing was activated on the solar power inverter from which the data was loaded, the following message appears.



    → If active or apparent power limitation was activated on the solar power inverter from which the data was loaded, the following message appears.



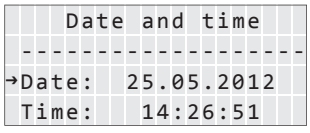
11. If the above mentioned messages appear, press the ↵ button to confirm each.



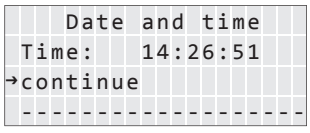
12. Press the ↓ ↑ buttons to select ***No*** and then press the ↵ button.

    → The **Date and Time** menu is displayed.

NOTE: If you wish to change the loaded values, select ***Yes***. Commissioning then continues with the grid selection and is the same as the initial commissioning.

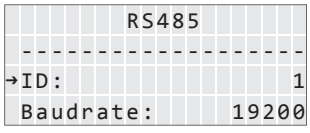


13. To change the value, press the ↵ button and then set the value using the ↓ ↑ buttons. Press the ↵ button to apply the value.



14. Press the ↓ ↑ buttons to select ***continue*** and then press the ↵ button.

    → The **RS485** menu is displayed.



15. To change the value, press the ↵ button and then set the value using the ↓ ↑ buttons. Press the ↵ button to apply the value.

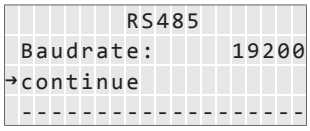
NOTE: If multiple solar power inverters are to be connected via RS485, select a different ID for each inverter. The ID is also used when saving and loading settings in order to identify the solar power inverter.

Available IDs:

1 ... 254

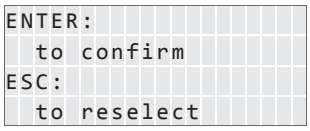
Available baudrates:

2400 | 4800 | 9600 | 19200 | 38400



16. Press the ↓ ↑ buttons to select ***continue*** and then press the ↵ button.

    → The completion screen will be displayed.



17. Press the ↵ button to complete commissioning.

    or

    Press the button to change settings.

☑ Commissioning is now finished.

NOTE

- If the solar power inverter is configured to the DE LVD or DK LVD grids, you can also configure active and reactive power control, see “10.9 Active power control”, p. 62 and “10.10 Reactive Power Control”, p. 64.
- The solar power inverter offers some optional functions available for all grids, see “10 Settings”, p. 58.
- On completion of commissioning, save the settings (see “11.5 Saving settings”, p. 72) and the swap data (see “11.7 Saving swap data”, p. 74) on a USB stick so that you can use this information later.

9. Production information

NOTE

All production information is provided for orientation purposes only. The measuring devices and meters provided by the electricity supply company are the authoritative source of information for invoicing.

9.1 Overview

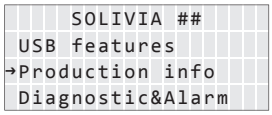
Menu	400 Product Info

Description

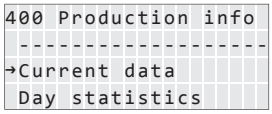
Contains all production data arising since first commissioning of the solar power invertor, and the current production data.

Accessing the Menu

Main Menu > Production Info



1. In the main menu, press the ↓ ↑ buttons to select ***Production Info*** and then press the ↵ button.



2. Press the ↓ ↑ buttons to select the required statistics and then press the ↵ button.

Structure

Submenu	Contents	Description
410 Current Data	Current data for power, AC, PV (DC), insulation	“9.2 Actual data”, p. 55
420 Day Statistics	Statistics for AC, PV (DC), insulation	“9.3 Other statistics”, p. 56
430 Week Statistics		
440 Month Statistics		
450 Year Statistics		
460 Total Statistics		
470 Feed-In Settings	Settings for currency and revenue per kWh	“10.7 Currency and Credit per kWh”, p. 61
480 Event Journal	List of operating state messages	“12.4.1 “External events” log”, p. 82
490 History	Statistics for the last seven days the solar power inverter was in operation.	“9.3 Other statistics”, p. 56

9.2 Actual data

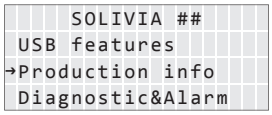
Menu	410 Current Data

Description

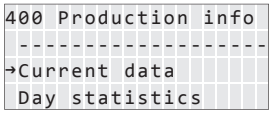
Displays the current production data for the solar power inverter.

Accessing the Menu

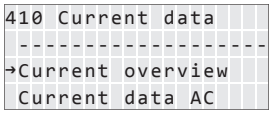
Main Menu > Production Info > Current Data



1. In the main menu, press the ↓ ↑ buttons to select ***Production Info*** and then press the ↵ button.

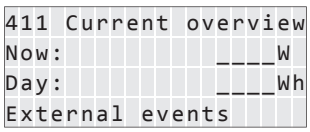
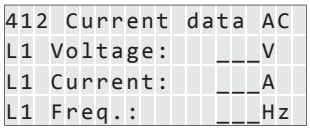
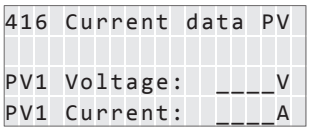
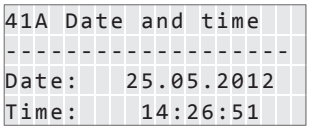


2. Press the ↓ ↑ buttons to select ***Current Data*** and then press the ↵ button.



3. Press the ↓ ↑ buttons to select the required statistics and then press the ↵ button.

Structure

Submenu	Display messages	Displayed values	Example display and description
411 Current overview	Now	Current power	
	Day	Energy generation on the current day	
	Ext. Events	Current operating state (see Chapter "12.1 Messages on Current Operating Status", p. 76)	If there are error messages, the list of messages can be opened by pressing the ↵ button. For a detailed description, see Chapter "12.3 Overview of Failure Messages/Troubleshooting", p. 80.
412 Actual data AC	L1 voltage	Current AC voltage for every phase	
	L1 current	Current AC current for every phase	
	L1 frequency	Current frequency for every phase	
	L1 P	Currently fed active power for every phase	
	L1 Q	Currently fed reactive power for every phase	
	L1 DC inj.	Current DC electricity component of AC current for every phase	
416 Current data PV	PV1 voltage	Current DC voltage on MPP tracker 1	
	PV1 current	Current DC current on MPP tracker 1	
41A Date and Time	Date	Current date	
	Time	Current time	Use the **110 Date and Time** menu to set the values, see "10.3 Date and time", p. 59.

Submenu	Display messages	Displayed values	Example display and description
41B Actual isolation	R iso+	Current insulation resistance for DC+ (DC PLUS)	41B Current isolat. -------------------- R iso+: ____kΩ R iso-: ____kΩ
	R iso-	Current insulation resistance for DC– (DC MINUS)	

9.3 Other statistics

Sub-menus
420 Day Statistics
430 Week Statistics
440 Month Statistics
450 Year Statistics
460 Total Statistics
490 History

Description

The statistics for day, week, month, year and total production time all provide the same type of data.

The **490 History** menu shows the statistics for the last seven days the solar power inverter was in operation. These seven days do not have to be consecutive.

Structure

Submenu	Display messages	Displayed values	Example Display and Description
421 Day Stats AC **431 Week stat. AC** **441 Month stat. AC** **451 Year stat. AC** **461 Total stat. AC**	Energy	Energy fed over selected period	421 Day stat. AC Energy: _____Wh Runtime: __:__h Revenue: __.__EUR
	Runtime	Operation time in the selected period	
	Revenue	Targeted revenue in the selected period; the settings can be made in the menu **470 Feed-In Settings**, see Chapter "10.7 Currency and Credit per kWh", p. 61.	
	L1 Δf 50,00/50,10 Hz	Minimum/maximum frequency in the selected period	
	L1 Imax	Maximum AC current for each phase in the selected period	
	L1 ΔU 228/240V	Minimum/maximum AC voltage in the selected period	
	L1 Pmax	Maximum fed-in active power in the selected period	
	L1 Qmax	Maximum fed-in reactive power in the selected period	
	L1 Qmin	Minimum fed-in reactive power in the selected period	
422 Day stat. DC **432 Week stat. DC** **442 Month stat. DC** **452 Year stat. DC** **462 Total stat. DC**	PV1 Pmax	Maximum DC power in the selected period on MPP tracker 1	422 Day stat. DC PV1 Pmax: _____W PV1 Imax: __,_A PV1 Umax: ____V
	PV1 Imax	Maximum DC current in the selected period on MPP tracker 1	
	PV1 Umax	Maximum DC voltage in the selected period on MPP tracker 1	
423 Day stat. ISO **433 Week stat. ISO** **443 Month stat. ISO** **453 Year stat. ISO** **463 Total stat. ISO**	R iso max	Maximum insulation resistance in the selected period	423 Day stat. ISO R iso max: ____kΩ R iso min: ____kΩ
	R iso min	Minimum insulation resistance in the selected period	

Submenu	Display messages	Displayed values	Example Display and Description
491 day: 04.05.12 **492 day: ...** **493 day: ...** **494 day: ...** **495 day: ...** **496 day: ...** **497 day: ...**		Statistics for the last seven days the solar power inverter was in operation. The statistics contain the same information as menus **421**, **422** and **423**.	491 Day: 04.05.12 Energy: _____Wh Runtime: __:__h Revenue: __.__EUR

EN

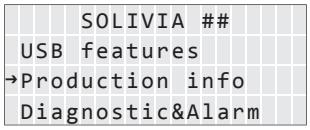
9.4 Reset Statistics

Menu	471 Statistics

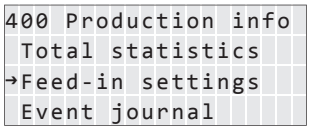
Description

All statistics can be reset, the old data are saved internally.

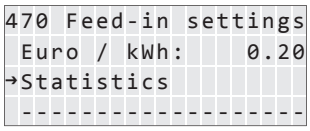
Procedure



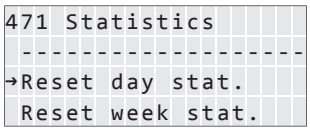
1. In the main menu, press the ↓↑ buttons to select **Production Info** and then press the ↵ button.



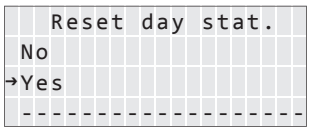
2. Press the ↓↑ buttons to select **Feed-In Settings** and then press the ↵ button.



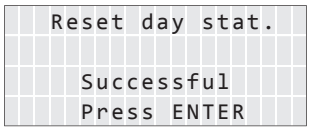
3. Press the ↓↑ buttons to select **Statistics** and then press the ↵ button.



4. Press the ↓↑ buttons to select the statistics to be reset and then press the ↵ button.



5. To reset the statistics, use the ↓↑ buttons to select the ***Yes*** entry and press the ↵ button.



☑ The statistics are reset.

10. Settings

10.1 Overview

Setting	
Display language	Page 58
Date and Time	Page 59
Date and time formats	Page 59
Backlighting and contrast	Page 60
RS485 (EIA485)	Page 60
Currency and Credit per kWh	Page 61
Reset Statistics	Page 61
Active Power Control	
Active Power Reduction	Page 62
Active power by frequency	Page 63
Reactive Power Control	
Power factor by active power	Page 64
Constant power factor	Page 66
Local Control (Italy only)	Page 66
Shadowing (extended MPP tracker)	Page 67
Insulation and grounding monitoring	Page 67
Standard menu	Page 68

10.2 Display language

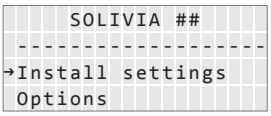
Menu	100 Install Settings

Description

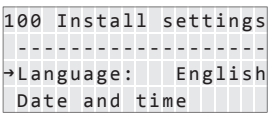
Allows the display language to be configured.

Accessing the Menu

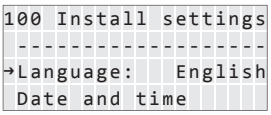
Main Menu > Install Settings



1. In the main menu, press the ↓ ↑ buttons to select ***Install Settings*** and then press the ↵ button.



2. Press the ↓ ↑ buttons to select ***Language*** and then press the ↵ button.



3. Press the ↓ ↑ buttons to select the language and then press the ↵ button.

Access via Button Combinations

Press the ESC and ↓ buttons simultaneously.

Configurable Parameters

Display Text	Designation	Description
Language	Language	The display language. Czech | Danish | Dutch | English | French | German | Italian | Polish | Portuguese | Romain | Slovak | Slovenian | Spanish

10.3 Date and time

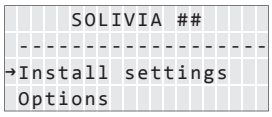
Menu	110 Date and time

Description

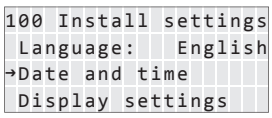
Allows the date and time to be configured.

Accessing the Menu

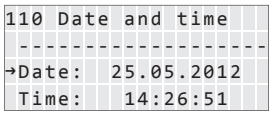
Main menu > Install settings > Date and time



1. In the main menu, press the ↓↑ buttons to select ***Install Settings*** and then press the ↵ button.



2. Press the ↓↑ buttons to select ***Date and Time*** and then press the ↵ button.



3. Select a parameter with the ↓↑ buttons. Press the ↵ button to change the value.

Configurable Parameters

Display Text	Designation	Description
Date	Date	Freely configurable according to the selected date format
Time	Time	Freely configurable according to the selected time format

10.4 Date and time formats

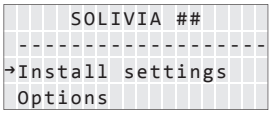
Menu	111 Format

Description

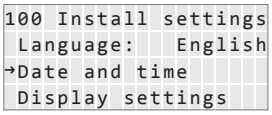
Allows the date and time formats to be configured.

Accessing the Menu

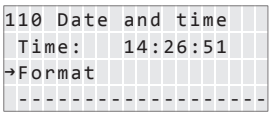
Main menu > Install settings > Date and time > Format



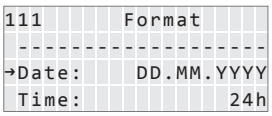
1. In the main menu, press the ↓↑ buttons to select ***Install Settings*** and then press the ↵ button.



2. Press the ↓↑ buttons to select ***Date and Time*** and then press the ↵ button.



3. Press the ↓↑ buttons to select ***Format*** and then press the ↵ button.



4. Select a parameter with the ↓↑ buttons. Press the ↵ button to change the value.

Configurable Parameters

Display Text	Designation	Description
Date	Date format	DD.MM.YYYY DD/MM/YYYY DD-MM-YYYY MM.DD.YYYY MM/DD/YYYY MM-DD-YYYY YYYY.MM.DD YYYY/MM/DD YYYY-MM-DD
Time	Time format	12h | 24h

10.5 Backlighting, contrast

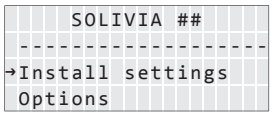
Menu	120 Display settings

Description

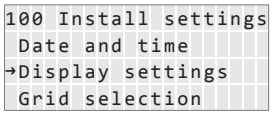
Allows backlighting and contrast to be configured.

Accessing the Menu

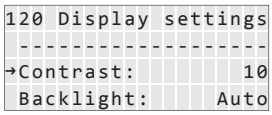
Main menu > Install settings > Display settings



1. In the main menu, press the ↓ ↑ buttons to select ***Install Settings*** and then press the ↵ button.



2. Press the ↓ ↑ buttons to select ***Display Settings*** and then press the ↵ button.



3. Select a parameter with the ↓ ↑ buttons. Press the ↵ button to change the value.

Configurable Parameters

Display Text	Designation	Description
Backlight	Display backlighting	Auto | On Auto = The backlighting switches on when a display button is pressed. On = The backlighting is always switched on.
Contrast	Display contrast	1 ... 10

10.6 RS485 (EIA485) Settings

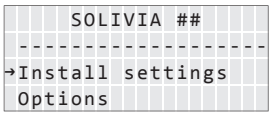
Menu	140 RS485

Description

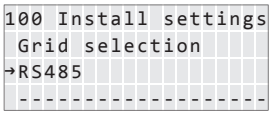
Allows the ID and baudrate of the RS485 interface to be configured.

Accessing the Menu

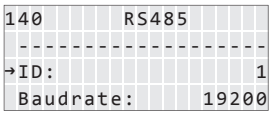
Main menu > Install settings > RS485



1. In the main menu, press the ↓ ↑ buttons to select ***Install Settings*** and then press the ↵ button.



2. Press the ↓ ↑ buttons to select ***RS485*** and then press the ↵ button.



3. Select a parameter with the ↓ ↑ buttons. Press the ↵ button to change the value.

Configurable Parameters

Display Text	Designation	Description
ID	Solar Power Inverter Identification Number	1 .. 254
Baudrate	Baudrate	2400 | 4800 | 9600 | 19200 | 38400, the standard is 19200

NOTE

Connecting Multiple Solar Power Inverters via RS485

- ► Select a different ID for each solar power inverter.
- ► A termination resistor must be connected to the last solar power inverter in the series (see “7.5 Connect RS485 (EIA485) - optional”, p. 32).
- ► This termination resistor can be ordered from Delta, see “16.1 Order numbers”, p. 89.

10.7 Currency and Credit per kWh

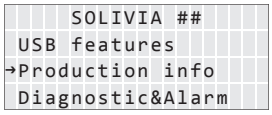
Menu	470 Feed-In Settings

Description

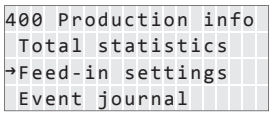
Allows the currency and credit per kWh to be configured. The statistics can also be reset.

Accessing the Menu

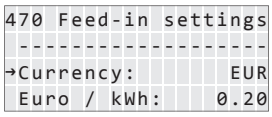
Main Menu > Production Info> Feed-In Settings



1. In the main menu, press the ↓ ↑ buttons to select ***Production Info*** and then press the ↵ button.



2. Press the ↓ ↑ buttons to select ***Feed-In Settings*** and then press the ↵ button.



3. Select a parameter with the ↓ ↑ buttons. Press the ↵ button to change the value.

Configurable Parameters

Display Text	Designation	Description
Currency	Currency	Freely configurable, no predefined values.
EUR/kWh	EUR/kWh	Freely configurable, no predefined values. The amount per kWh is required for the revenue calculation.
Statistics	Deleting Statistics	Allows individual statistics to be deleted, see "9.4 Reset Statistics", p. 57.

10.8 Reset Statistics

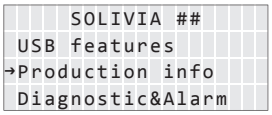
Menu	471 Statistics

Description

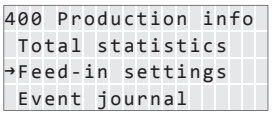
Allows the statistics to be reset. The currency and credit per kWh can also be configured.

Accessing the Menu

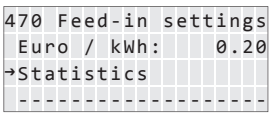
Main Menu > Production Info > Feed-In Settings > Statistics



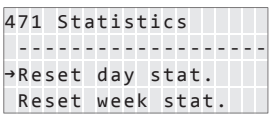
1. In the main menu, press the ↓ ↑ buttons to select ***Production Info*** and then press the ↵ button.



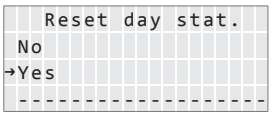
2. Press the ↓ ↑ buttons to select ***Feed-In Settings*** and then press the ↵ button.



3. Press the ↓ ↑ buttons to select ***Statistics*** and then press the ↵ button.



4. Press the ↓ ↑ buttons to select statistics to delete and then press the ↵ button.



5. Press the ↓ ↑ buttons to select ***Yes*** and then press the ↵ button.

Configurable Parameters

Display Text	Designation	Description
Day stats	Day statistics	
Week stats	Week statistics	
Month stats	Month statistics	
Year stats	Year statistics	
Total stats	Total statistics	
History	History	Statistics for the last seven days the solar power inverter was in operation.

10.9 Active power control

NOTE

Active power control is available for grids as per VDE-AR-N 4105. DE LVD and DK LVD.

NOTE

Changes to active and reactive power control can affect energy production.

Ask your installer before changing the settings.

10.9.1 Overview

Function/Mode	Description
Active Power Reduction	Limits the maximum fed active power
Active power by frequency	Limits the fed active power depending on grid frequency

10.9.2 Active Power Reduction

Menu	511 Power Reduction

NOTE

The settings in the **511 Power Reduction** menu affect the "Power Factor by Active Power cos φ (P)" function, see "10.10.2 Power Factor by Active Power cos φ (P)", p. 64.

Description

This function is available for grids as per VDE-AR-N 4105.

The maximum permissible active power can be set as a percentage of the maximum power of the solar power inverter.

To deactivate this function, set the value to "0%".

If a power limit was set during commissioning, the percent value relates to the maximum active power that was set.

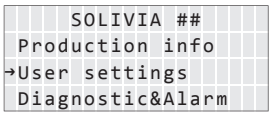
Example:

You have a SOL5.0-1TR1 and the maximum active power ***Pmax*** at commissioning is limited to 4 kW.

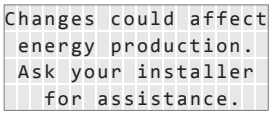
If you set 80% in the **511 Power Reduction** menu, the maximum permitted active power is calculated as 4 kW x 80% = 3.2 kW.

Accessing the Menu

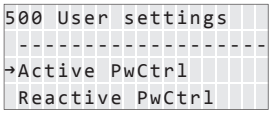
Main menu > User settings > Active PwCtrl > Power reduction



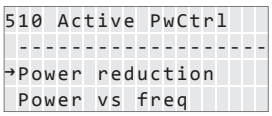
1. In the main menu, press the ↓↑ buttons to select ***User Settings*** and then press the ↵ button.



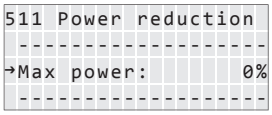
2. Press the ↵ button to confirm.



3. Press the ↓↑ buttons to select ***Active PwCtrl*** and then press the ↵ button.



4. Press the ↓↑ buttons to select ***Power Reduction*** and then press the ↵ button.



5. Press the ↵ button to change the value.

Configurable Parameters

Display Text	Designation	Description
Max power	Maximum active power	Limits the active power to the set value.

10.9.3 Active Power by Frequency P(f)

Menu	512 Power/Frequency

Description

This function is available for grids as per VDE-AR-N 4105.

Allows the statistics to be reset. The currency and credit per kWh can also be configured.

This function alters the fed active power depending on the grid frequency. If a starting frequency is exceeded, the fed active power is limited. If a stopping frequency is exceeded, the active power is no longer fed.

Behavior as per VDE AR N 4105 is described below.

Variant 1: The grid frequency alters between f_{Start} and f_{Stop}.

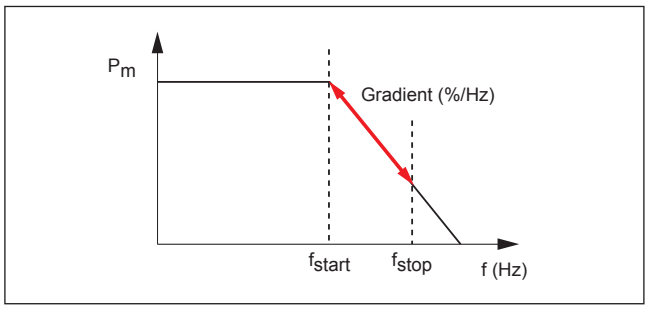


Fig. 10.1: Function P(f), variant 1

Once the grid frequency exceeds the value f_{Start}, the value of the active power P_m being fed at this moment is automatically saved and active power limiting is activated.

As long as the grid frequency stays above f_{Start} and under f_{Stop}, the fed active power value runs along the gradients: Active power drops with increasing grid frequency and increases with decreasing grid frequency.

Variant 2: The grid frequency exceeds f_{Stop}.

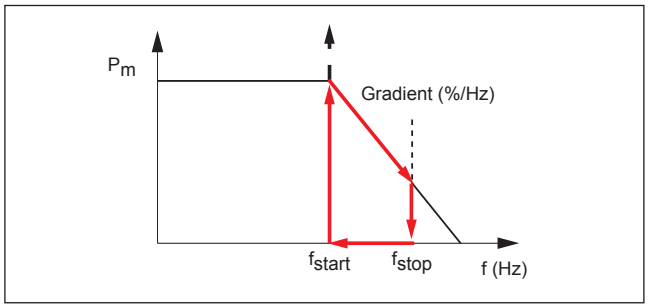


Fig. 10.2: Function P(f), variant 2

When the grid frequency exceeds f_{Start} but then remains under f_{Stop}, the solar power inverter behaves as described in variant 1.

However, as soon as the grid frequency exceeds f_{Stop}, the active power feed is stopped.

Active power feed will resume once the grid frequency falls below f_{Start}. Once resumed, the active power will increase by 10% per minute.

Accessing the Menu

Main menu > User settings > Active PwCtrl > Power vs freq

```
    SOLIVIA ##
 Production info
→User settings
 Diagnostic&Alarm
```

1. In the main menu, press the ↓↑ buttons to select ***User Settings*** and then press the ↵ button.

```
Changes could affect
 energy production.
 Ask your installer
   for assistance.
```

2. Press the ↵ button to confirm.

```
500 User settings
 --------------------
→Active PwCtrl
 Reactive PwCtrl
```

3. Press the ↓↑ buttons to select ***Active PwCtrl*** and then press the ↵ button.

```
510 Active PwCtrl
 Power reduction
→Power vs freq
 --------------------
```

4. Press the ↓↑ buttons to select ***Power vs freq*** and then press the ↵ button.

```
512 Power vs freq
 --------------------
→Start freq: 50.20Hz
 Stop freq:  51.50Hz
```

5. Select a parameter with the ↓ ↑ buttons. Press the ↵ button to change the value.

Configurable Parameters

Display Text	Designation	Description
`Start freq`	Start frequency	Frequency at which the feeding of active power is limited. Value range: 50.00 .. 65.00 Hz Standard: 50.20 Hz
`Stop freq`	Stop frequency	Frequency at which the feeding of active power is stopped. Value range: 50.00 .. 65.00 Hz Standard: 51.50 Hz
`Gradient`	Gradient	Adjustment of the fed active power in percent per Hz. Value range: 0 .. 150% Standard: 40 %

EN

10.10 Reactive Power Control

NOTE

Active power control is available for grids as per VDE-AR-N 4105. `DE LVD` and `DK LVD`.

NOTE

Changes to active and reactive power control can affect energy production.

Ask your installer before changing the settings.

10.10.1 Overview

Function/Mode	Description
Power factor by active power	For setting a value of cos φ (inductive or capacitive) depending on the active power ratio P/P_n
Constant power factor	For setting a fixed value for cos φ (inductive or capacitive)

Only one mode can be active at one time.

10.10.2 Power Factor by Active Power cos φ (P)

Menu	520 Reactive PwCtrl

Description

This function is available for grids as per VDE-AR-N 4105.

This function can be used to determine a separate cos φ for four different power ratios P/P_n (see “Fig. 10.3 Setting Ranges for “cos φ (P)” Function”, p. 64).

P/P_n is the ratio between the current active power and the rated power of the solar power inverter. Power ratio and cos φ are assigned to points in pairs. The power ratios for points A and D are fixed at 0%/100%. For points B and C, the power ratios can be configured within the predefined limits. The cos φ can be configured for all four points.

For example, the parameters `B P/Pn ratio` and `B cos phi` belong to point B. The parameters `A P/Pn ratio` and `D P/Pn ratio` are not displayed, since they are fixed at 0%/100%.

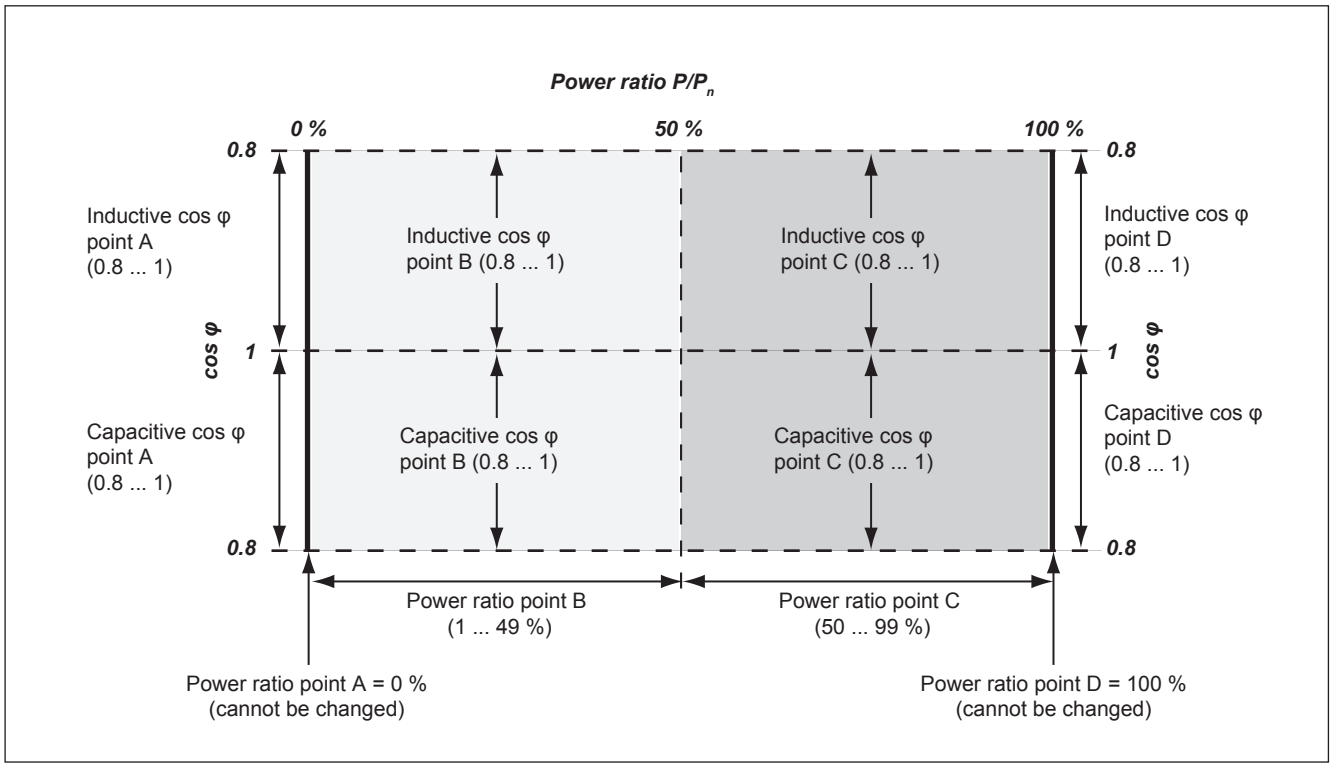

Power ratio P/Pn
0 %
50 %
100 %
0.8
1
cos φ
Inductive cos φ point A (0.8 ... 1)
Inductive cos φ point B (0.8 ... 1)
Inductive cos φ point C (0.8 ... 1)
Inductive cos φ point D (0.8 ... 1)
Capacitive cos φ point A (0.8 ... 1)
Capacitive cos φ point B (0.8 ... 1)
Capacitive cos φ point C (0.8 ... 1)
Capacitive cos φ point D (0.8 ... 1)
Power ratio point B (1 ... 49 %)
Power ratio point C (50 ... 99 %)
Power ratio point A = 0 % (cannot be changed)
Power ratio point D = 100 % (cannot be changed)

Fig. 10.3: Setting Ranges for "cos φ (P)" Function

Example

The parameters for points A to D are configured in this example as follows:

Display Text	Description
A cos phi: ind 1.00	Point A: cos φ is set to ***inductive 1.00***. Since cos φ = 1.00, ***capacitive*** could also be configured. The power ratio P/Pn is automatically set to 0 % and cannot be changed.
B cos phi: ind 0.95	Point B: cos φ is set to ***inductive 1.00***.
B P/Pn ratio: 23%	Point B: Power ratio P/Pn is set to ***23 %***.
C cos phi: cap 0.90	Point C: cos φ is set to ***capacitive 1.00***.
C P/Pn ratio: 75%	Point C: Power ratio P/Pn is set to ***75 %***.
D cos phi: cap 0.95	Point D: cos φ is set to ***inductive 0.95***. The power ratio P/Pn is automatically set to 100 % and cannot be changed.

This results in the following behavior from the solar power inverter, depending on the current fed active power:

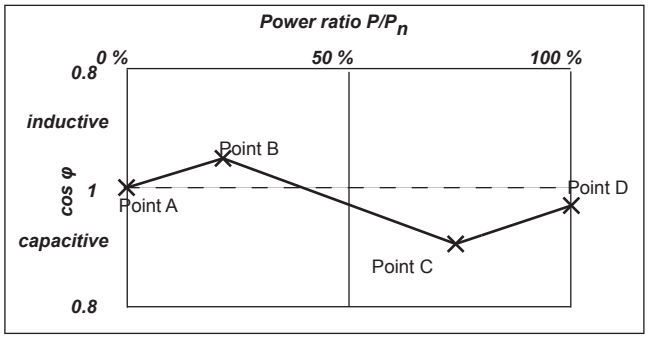


Fig. 10.4: Example of configuring cos φ (P) function

When changing the currently fed active power, the cos φ runs along the plotted line.

Effects of Active Power Limitation on Behavior of "cos φ (P)" Function

If active power limitation is configured during commissioning and/or through the "power reduction" function, the behavior of the "cos φ (P)" function changes.

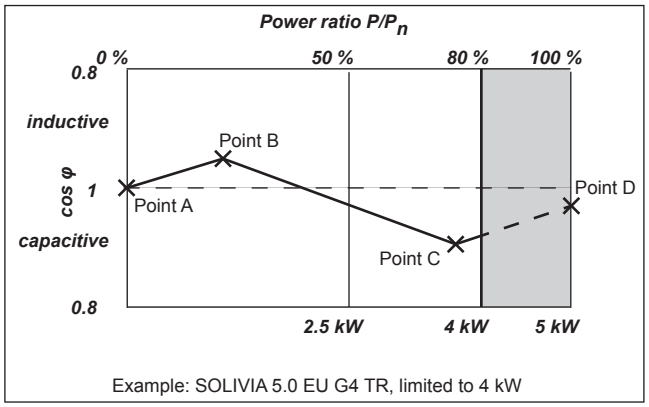
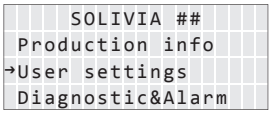


Fig. 10.5: Effect of active power limitation on the "cos □□ (P)" function

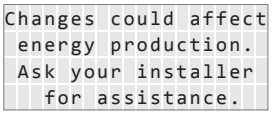
This active power reduction to 4 kW means point D can never be achieved. This applies for the entire grey area.

Accessing the Menu

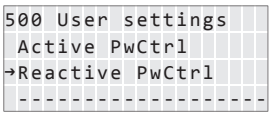
Main Menu > User Settings > Reactive PwCtrl



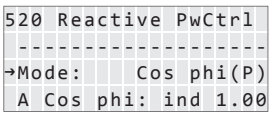
1. In the main menu, press the ↓↑ buttons to select ***User Settings*** and then press the ↵ button.



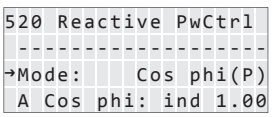
2. Press the ↵ button to confirm.



3. Press the ↓↑ buttons to select ***Reactive PwCtrl*** and then press the ↵ button.



4. Press the ↓↑ buttons to select ***Mode*** and then press the ↵ button.



5. Press the ↓↑ buttons to set ***Mode*** to ***Cos phi (P)*** and then press the ↵ button.

6. Select a parameter with the ↓ ↑ buttons. Press the ↵ button to change the value.

Configurable Parameters

(see Fig. 10.3 auf Seite 64)

Display Text	Designation	Description
A cos phi: ind 1.00	Point A: cos φ	inductive 0.8 ... 1.0 **or** capacitive 0.8 ... 1.0
B cos phi: ind 1.00	Point A: cos φ	inductive 0.8 ... 1.0 **or** capacitive 0.8 ... 1.0
B P/Pn ratio:	Point B: Power ratio P/P_n	1 ... 49 %
C cos phi: ind 1.00	Point C: cos φ	inductive 0.8 ... 1.0 **or** capacitive 0.8 ... 1.0
C P/Pn ratio:	Point C: Power ratio P/P_n	50 ... 99 %
D cos phi: ind 1.00	Point D: cos φ	inductive 0.8 ... 1.0 **or** capacitive 0.8 ... 1.0

10.10.3 Constant Power Factor cos φ

Menu	520 Reactive PwCtrl

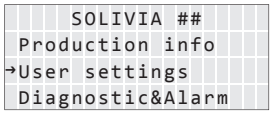
Description

This function is available for grids as per VDE-AR-N 4105.

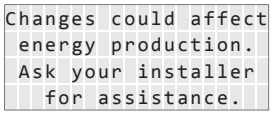
Allows a constant cos φ power factor to be configured.

Accessing the Menu

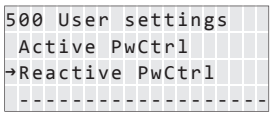
Main Menu > User Settings > Reactive PwCtrl



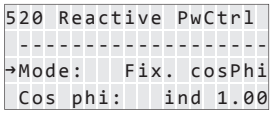
1. In the main menu, press the ↓ ↑ buttons to select ***User Settings*** and then press the ↵ button.



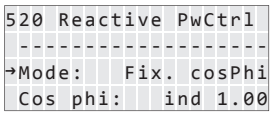
2. Press the ↵ button to confirm.



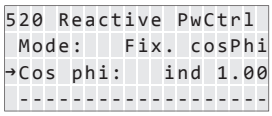
3. Press the ↓ ↑ buttons to select ***Reactive PwCtrl*** and then press the ↵ button.



4. Press the ↓ ↑ buttons to select ***Mode*** and then press the ↵ button.



5. Press the ↓ ↑ buttons to set ***Mode*** to ***Cos phi (P)*** and then press the ↵ button.



6. Press the ↓ ↑ buttons to select the parameter ***Cos Phi***. Press the ↵ button to change the value.

Configurable Parameters

Display Text	Designation	Description
Cos Phi	cos φ	Defines cos φ to be the set value. inductive | capacitive 1 ... 0.8

10.11 Settings as per CEI 0-21 (only for Italy)

NOTE

This function is only available for the IT BT 21 grid.

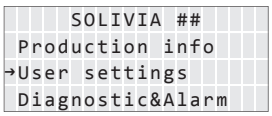
Menu	500 User Settings

Description

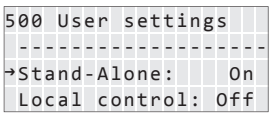
In accordance with CEI 0-21:2012-12, the integrated grid and system protection (SPI) can be activated or deactivated for PV systems equal to or lower than 6 kW.

Accessing the Menu

Main Menu > User Settings



1. In the main menu, press the ↓ ↑ buttons to select ***User Settings*** and then press the ↵ button.



2. To change the setting, press the ↵ button and then change the value using the ↓ ↑ buttons.

Configurable Parameters

Display Text	Designation	Description
Local control	Local control	On | Off On = Parameter as per CEI 0-21:2012-06 Sect. 8.6

NOTE

The parameters that must be configured under CEI 0-21:2012-12 can be changed using the Delta service software.

10.12 Shadowing (extended MPP tracker)

Menu	210 Shadowing

Description

The "Shadowing" option is an extended MPP tracker. When the option is switched on, the MPP tracker performs an additional search at regular intervals.

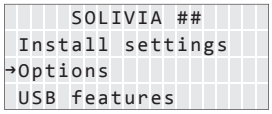
The MPP tracker then searches for the maximum power over a wider voltage range.

This option should be switched on if shadows regularly pass slowly over the solar modules in the course of a day. These types of moving shadows can be caused by chimneys or trees, for example. This function has a relatively small effect in the case of fast-moving shadows, e.g., from passing clouds.

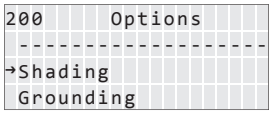
The function is configured depending on the size of the shadowing.

Accessing the Menu

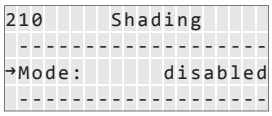
Main Menu > Options > Shadowing



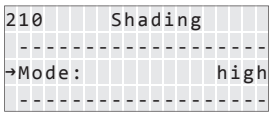
1. In the main menu, press the ↓ ↑ buttons to select ***Options*** and then press the ↵ button.



2. Press the ↓ ↑ buttons to select ***Shadowing*** and then press the ↵ button.



3. Press the ↵ button to set the mode.



4. Press the ↓ ↑ buttons to configure the size of the shadowing and then press the ↵ button.

Configurable Parameters

Display Text	Designation	Description
Mode:	Mode	disabled Extended MPP tracking is deactivated
		high High shadowing, time cycle: 0.5 hours
		medium Medium shadowing, time cycle: 2 hours
		low Low shadowing, time cycle: 4.5 hours

10.13 Insulation and grounding monitoring

Menu	230 Grounding

Description

The DC side of the solar power inverter has an insulation and grounding monitor.

The insulation monitoring offers two modes:

- ISO Error
- ISO Warning

If the positive or negative pole of the solar modules must be grounded to meet the requirements of the module manufacturer, then this grounding can be monitored. The grounding monitoring has four modes:

- – GND Error
- – GND Warning
- + GND Error
- + GND Warning

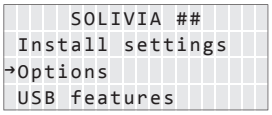
Before delivery, the solar power inverter is set at the factory to ***ISO Warning*** (insulation warning) mode.

Description of the monitoring modes:

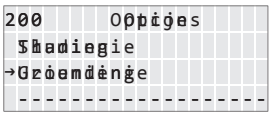
Monitoring Mode	Description
ISO/GND off	Monitoring is deactivated.
xxx Failure	In the event of an insulation or grounding failure, the solar power inverter is disconnected from the grid.
xxx Warning	If an insulation or grounding failure occurs, the solar power inverter logs and displays the failure but is not disconnected from the grid.

Accessing the Menu

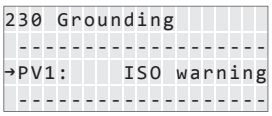
Main Menu > Options > Grounding



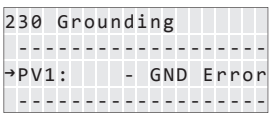
1. In the main menu, press the ↓ ↑ buttons to select ***Options*** and then press the ↵ button.



2. Press the ↓ ↑ buttons to select ***Grounding*** and then press the ↵ button.



3. Press the ↵ button to set the mode.



4. Press the ↓ ↑ buttons to set the mode and then press the ↵ button.

Configurable Parameters

Display Text	Designation	Description
PV1	PV1 monitoring	ISO Error ISO Warning – GND Error – GND Warning + GND Error + GND Warning ISO/GND off

10.14 Standard menu

Menu	800 Standard Menu

Description

A standard menu can be defined, which is automatically displayed when the display buttons are not used for a certain period of time. When the standard menu is displayed, pressing the ESC button displays the main menu.

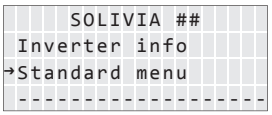
The standard menu is set at the factory to **411 Current Overview**. This menu shows the current data and current operating messages.

The number must be a valid menu number.

See "16.2 Overview of menu structure", p. 90 for an overview of all available menu numbers.

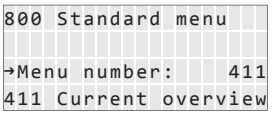
Accessing the Menu

Main Menu > Standard Menu

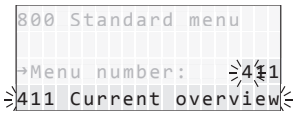


1. In the main menu, press the ↓↑ buttons to select ***Standard Menu*** and then press the ↵ button.

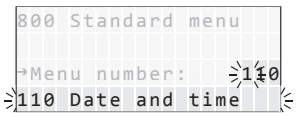
   → The menu number of the current standard menu is displayed.



2. Press the ↵ button.

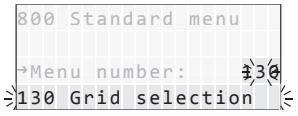


   → The first number and the menu name flash.

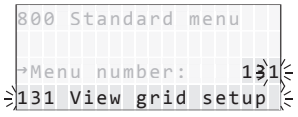


3. Press the ↓↑ buttons to set the first digit of the menu number.

   → The menu name is automatically changed to match the current selection.



4. Press the ↵ button and then set the second digit of the menu number with the ↓↑ buttons.



5. Press the ↵ button and then set the third digit of the menu number with the ↓↑ buttons.

6. Press the ↵ button to finish.

Configurable Parameters

Display Text	Designation	Description
Menu number	Menu number	Any valid menu number.

10.15 Changing Grid

ATTENTION

If the selected grid is changed, a completely new commissioning process is started, see "8 Commissioning", p. 36.

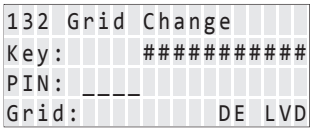
► Always contact the Delta Support Team **before** changing the selected grid. You can find contact information on the back of this manual.

After completion of initial commissioning, the configured grid can be changed using a PIN. Each time you wish to select a new grid or change the protected settings for the current grid, you will need a new PIN. You can obtain this PIN from Delta Support.

Requesting PIN from Delta Support

You must provide a key in order to receive a PIN. You will find the key in the **132 Grid Change** menu.

1. To display the key, navigate to **Main Menu > Install Settings > Grid Selection> Grid Change**.



2. Contact the Delta Support Team with the key to receive the four-digit PIN.

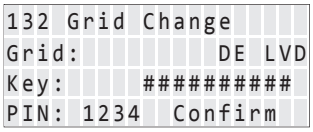
Entering PIN

1. After receiving the PIN, go back to the **132 Grid Change** menu.
2. Press the ↵ button to enter the PIN.

   → The first digit of the PIN will begin flashing.

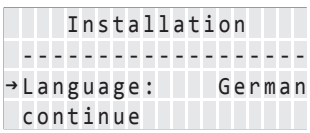
3. Use the ↓↑ buttons to set the first digit of the PIN. Next, press the ↵ button to move to the next digit.

   → After entering the full PIN, the word ***Confirm*** flashes.



4. Press the ↵ button to confirm.

   → The **Installation** menu is displayed.



5. Start commissioning the solar power inverter, see "8 Commissioning", p. 36.

11. Saving and loading data and settings

ATTENTION

The IP 65 degree of protection is no longer guaranteed when the USB interface protective cover is removed.

- ► Only remove the protective cover when necessary.
- ► Where possible, use a Micro-USB stick. The protective cover is designed to be screwed down over a Micro-USB stick.

11.1 Before you begin

Information on operating the display is provided in „5.4 Display and Buttons“, p. 14.

Data and settings can be saved and loaded via the solar power inverter's USB interface.

All saving and loading functions are available under the **300 USB features** menu.

The following functions are available:

- Save swap data
- Save/load settings
- Create reports

NOTE

The swap data can be loaded only during commissioning, see “8.8 Commissioning after replacing a solar power inverter”, p. 51.

11.2 Organize files

Here are a couple of notes on organizing saved and loaded files.

When saving, the files are always saved to the main directory of the USB drive.

The file names are always the same for all SOL...TR...-type solar power inverters. For example, the settings are saved in a file under "STUP_###.TXT". The ### stands for the RS485 ID of the solar power inverter, e.g. "001". The RS485 ID is a number for identifying the solar power inverter.

The RS485 ID for all solar power inverters is set by the factory to "1".

This can cause the following problem:

Two solar power inverters are in a PV system. The RS485 ID ("1") set by the factory was not changed.

You save the settings of the first solar power inverter to a USB drive. You then save the settings from the second solar power inverter to the same USB drive. Since the RS485 ID for both power inverters is the same, the file name is also the same. The file from the first power inverter is then overwritten.

There are multiple ways to avoid this problem:

- ► If multiple solar power inverters are installed in a PV system, set a different RS485 ID for each solar power inverter.
- ► Use a separate USB drive for each solar power inverter.
- ► Create a separate subdirectory on the USB drive for each power inverter. After saving the files from a power inverter, copy these files to that power inverter's subdirectory. This requires a computer.

Renaming the files is not recommended. When loading data, the solar power inverter searches for file names exactly matching the preset template (e.g. "STUP_###.TXT"). If the file name does not match this template, the file will not be recognized.

You should always save the files to a computer since a USB drive can break easily. The data would then be lost.

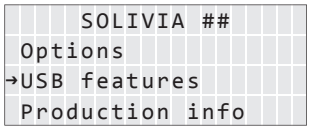
EN

11.3 Enabling/disabling the USB interface

The USB interface is disabled by default. To use the USB interface for saving and loading, it must be enabled.

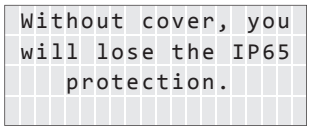
NOTE

The USB interface must be disabled again after use!



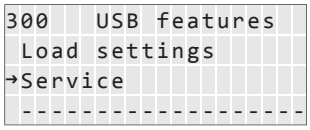
1. In the main menu, press the ↓ ↑ buttons to select ***USB features*** and then press the ↵ button.

   → A note on IP65 protection is then displayed.



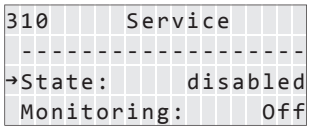
2. Press the ↵ button to confirm.

   → The **300 USB features** menu is then displayed.



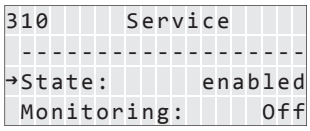
3. Press the ↓ ↑ buttons to select ***Service*** and then press the ↵ button.

   → The menu **310 Service** is displayed.



Press the ↓ ↑ buttons, to select ***Status*** and then press the ↵ button.

→ The status indicator flashes.



4. Press the ↓ ↑ buttons to select the desired item and then press the ↵ button.

   → The USB interface is now enabled/disabled.

EN

11.4 Updating firmware

The firmware can be updated via the USB interface.
The firmware update is performed in the solar power inverter in two steps:

- Manual loading of data from USB drive
- Automatic updating of solar power inverter's individual controllers

It is possible to load the data under AC or DC voltage. The data can also be loaded at night with no DC voltage.

The solar power inverter's individual controllers can, however, only be updated under DC voltage. The DC voltage must be applied for 10 minutes uninterrupted so that the firmware update is automatically performed.

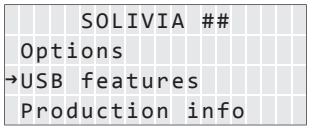
The following instructions describe loading the firmware data from a USB drive to the solar power inverter. The firmware update is then automatic.

NOTE

The file containing the firmware data must have the name "Image.hex" and must be located in the main directory of the USB stick.

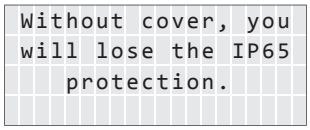
Rename the file correctly if necessary! This requires a computer!

1. Enable the USB interface (see „11.3 Enabling/disabling the USB interface“, p. 70).



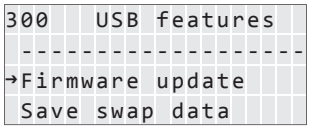
2. In the main menu, press the ↓ ↑ buttons to select ***USB features*** and then press the ↵ button.

   → A note on IP65 protection is then displayed.



3. Press the ↵ button to confirm.

   → The **300 USB features** menu is then displayed.



4. Press the ↓ ↑ buttons to select ***Firmware Update*** and then press the ↵ button.

   → The data is then loaded from the USB drive to the solar power inverter.

   Once DC voltage has been applied for at least 10 minutes, the firmware is updated.

5. Disable the USB interface (see „11.3 Enabling/disabling the USB interface“, p. 70).

NOTE: If the message `No files found` is displayed, make sure the files are in the main directory of the USB drive.

NOTE: If the message `Pendrive error` is displayed, make sure the USB drive is properly inserted.

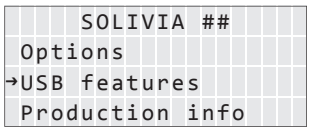
11.5 Saving settings

The solar power inverter settings can be saved to be loaded to another solar power inverter of the same type for use with the same settings.

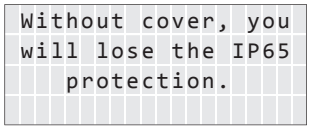
The saved settings are:

- Grid settings
- User settings
- Display settings
- Production settings

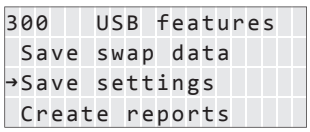
1. Enable the USB interface (see „11.3 Enabling/disabling the USB interface“, p. 70).



2. In the main menu, press the ↓ ↑ buttons to select ***USB features*** and then press the ↵ button.
   → A note on IP65 protection is then displayed.

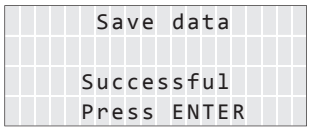


3. Press the ↵ button to confirm.
   → The **300 USB features** menu is then displayed.



4. Press the ↓ ↑ buttons to select ***Save Settings*** and then press the ↵ button.
   → The data is saved in a "STUP_###.CFG" file on the USB drive. The ### characters represent the RS485 ID of the solar power inverter from which the data is to be loaded, for example "001".

NOTE: If the message `Pendrive error` is displayed, make sure the USB drive is properly inserted.



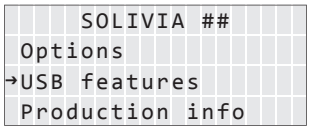
5. Press the ↵ button to confirm.

6. Disable the USB interface (see „11.3 Enabling/disabling the USB interface“, p. 70).

11.6 Loading settings

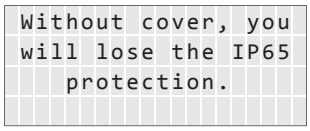
To simplify the setup procedure, the settings from another solar power inverter of the same type can be loaded and used in another solar power inverter that is to use the same settings. Information on saving the settings can be found in „11.5 Saving settings“, p. 72.

1. Enable the USB interface (see „11.3 Enabling/disabling the USB interface“, p. 70).



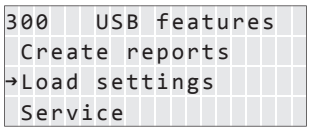
2. In the main menu, press the ↓ ↑ buttons to select ***USB features*** and then press the ↵ button.

   → A note on IP65 protection is then displayed.



3. Press the ↵ button to confirm.

   → The **300 USB features** menu is then displayed.



4. Press the ↓ ↑ buttons to select ***Load Settings*** and then press the ↵ button.

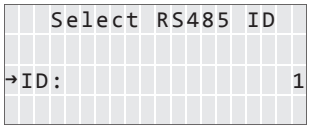
   → The solar power inverter searches for available files on the USB drive.

   When files are found, the **Select RS485 ID** menu is displayed.

NOTE: The STUP_###.CFG file must be in the main directory of the USB drive. The ### characters represent the RS485 ID of the solar power inverter from which the data is to be loaded, for example "001".

NOTE: If the message `Pendrive error` is displayed, make sure the USB drive is properly inserted.

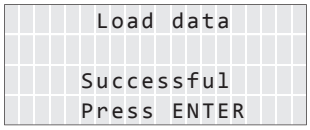
NOTE: If the message `No files found` is displayed, make sure the files are in the main directory of the USB drive.



5. Press the ↓ ↑ buttons to select the ***ID*** and then press the ↵ button.

   → The data is then loaded.

   A message is displayed when the loading process is successful.



6. Press the ↵ button to confirm.

7. Disable the USB interface (see „11.3 Enabling/disabling the USB interface“, p. 70).

11.7 Saving swap data

NOTE

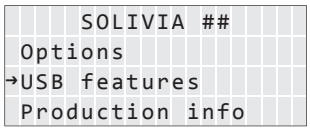
In this chapter, the term "swap" means replacing a solar power inverter with a new device of the same type, without changing the installation parameters, e.g., those of the solar modules.

The replacement may only be performed after consulting Delta Solar Support. The support team will discuss the correct procedure with you.

The following information is saved:

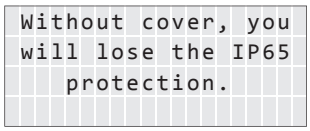
- Grid settings
- User settings
- Display settings
- Production settings
- RS485 ID
- Statistics
- Date of first installation

1. Enable the USB interface (see „11.3 Enabling/disabling the USB interface“, p. 70).



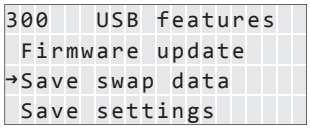
2. In the main menu, press the ↓ ↑ buttons to select ***USB features*** and then press the ↵ button.

   → A note on IP65 protection is then displayed.



3. Press the ↵ button to confirm.

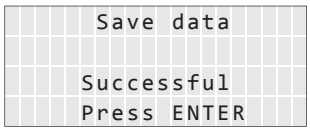
   → The **300 USB features** menu is then displayed.



4. Press the ↓ ↑ buttons to select ***Save Swap Data*** and then press the ↵ button.

   → The data is saved in a "SWAP_###.CFG" file on the USB drive. The ### characters represent the RS485 ID of the solar power inverter from which the data is to be loaded, for example "001".

NOTE: If the message `Pendrive error` is displayed, make sure the USB drive is properly inserted.



5. Press the ↵ button to confirm.

6. Disable the USB interface (see „11.3 Enabling/disabling the USB interface“, p. 70).

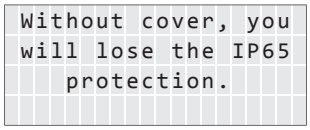
11.8 Creating reports

The reports contain the following information:

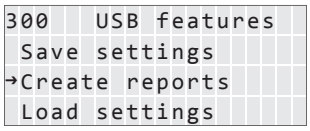
- Firmware/serial number of the model
- Statistics, events, comparisons with a summary of statistics and events
- Internal logs
- AT reports
- LVD reports (only for `DE LVD` and `DK LVD` grids)

1. Enable the USB interface (see „11.3 Enabling/disabling the USB interface“, p. 70).

2. In the main menu, press the ↓ ↑ buttons to select ***USB features*** and then press the ↵ button.
   → A note on IP65 protection is then displayed.

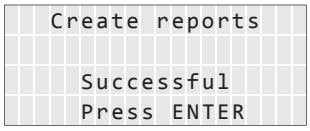


3. Press the ↵ button to confirm.
   → The **300 USB features** menu is then displayed.



4. Press the ↓ ↑ buttons to select ***Create Reports*** and then press the ↵ button.
   → The data is saved in a "SWAP_###.CFG" file on the USB drive. The ### characters represent the RS485 ID of the solar power inverter from which the data is to be loaded, for example "001".

NOTE: If the message `Pendrive error` is displayed, make sure the USB drive is properly inserted.



5. Press the ↵ button to confirm.

6. Disable the USB interface (see „11.3 Enabling/disabling the USB interface“, p. 70).

11.9 Service

This function is used for servicing purposes. You will be contacted by the Delta Support Team when this function must be used.

12. Diagnostics and Troubleshooting

12.1 Messages on Current Operating Status

12.1.1 Introduction

The following message categories are defined for displaying the operating status of the solar power inverter:

Message Category	Description	Message Classes	Grid Feed-In
Limited operation	Non-critical factors that can affect the production results but which are not failures (e.g., self-test).	–	Various
External event	External events occur outside the solar power inverter and affect its operating behavior.	Warning	Yes
		Failure	No
• Insulation and grounding failure	There is one or more problems with the insulation or grounding. Insulation and grounding problems are considered external events. However, these messages are only displayed when insulation and grounding monitoring is active (see Chapter „10.13 Insulation and grounding monitoring“, p. 67).	Warning	Yes
		Failure	No
Internal event	Internal events are problems within the solar power inverter.	Warning	Yes
		Failure	No
Change events	Certain parameters can be changed manually in the display or externally via the service software. All parameter changes are logged and can be read later- The configurations made determine whether or not a change event affects the production result.	–	Yes However, it is possible that a change event prevents the solar power inverter from feeding into the grid.

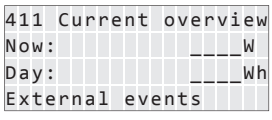
Table 12.1.: Message categories on operating status

The current operating status is indicated by the LEDs and text messages on the display in the **411 Current Overview** menu.

When a new event occurs, this is indicated automatically by the LEDs.

To read a text message for the event, switch to the menu **411 Current Overview**.

A brief description of the event is then shown on the fourth display line.



The software of the solar power inverter determines whether a warning is given or a failure occurs.

For problems with the insulation or grounding, you can use the **230 Grounding** menu to define whether a warning is given or a failure is triggered (see Chapter „10.13 Insulation and grounding monitoring“, p. 67).

12.1.2 Status Display of the LEDs

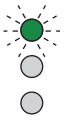
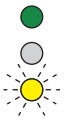
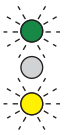
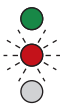
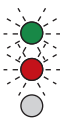
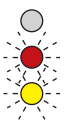
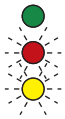
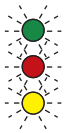
LED Display	Meaning
	Solar power invertor is not in operation
	Normal operation
	Synchronization
	Failure
	Warning during operation
	Warning during synchronization
	Insulation or grounding failure
	Insulation or grounding failure simultaneously with other failure
	Start operation
	Insulation or grounding failure simultaneously with other warning
	Insulation or grounding warning during normal operation
	Insulation or grounding warning during synchronization
	Insulation or grounding warning simultaneously with other failure
	Insulation or grounding warning simultaneously with other warning
	Insulation or grounding warning simultaneously with other warning during normal operation
	Insulation or grounding warning simultaneously with other warning during synchronization

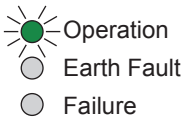
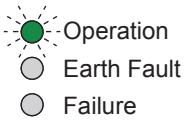
Table 12.2.: Status Display of the LEDs

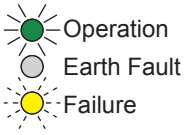
Meaning of LED symbols in the overview table.

LED symbol	Meaning
	LED stays on.
	LED flashes.
	LED is off.

EN

12.1.3 Messages on display

Message Category	Message level	LED Status	Display Text in 411 Current Overview	Description
Normal operation	–		`Normal operation`	When the green ***Operation*** LED is solid, the solar power inverter is feeding power into the grid.
Limited operation	–		e.g. `self-test`, `synchronization`	When the green ***Operation*** LED flashes, the solar power inverter is not feeding power into the grid.

External event
Internal event
	Warning		For external events:
			`Ext. Events`
			`For internal events:`
			`Warning ###` (3-digit number)
				For a warning, the yellow ***Failure*** LED flashes. The solar power inverter continues to feed power into the grid.

External event
Internal event
	Failure		For external events:
			`Ext. Events`
			`For internal failures:`
			`Failure ###` (3-digit number)
				For a failure, the yellow ***Failure*** LED is solid. The feed to the grid is stopped.

Insulation and grounding failure	Warning		`Ext. Events`	For an Isolation alarm, the red ***Earth Fault*** LED flashes. The solar power inverter continues to feed power into the grid.
	Failure		`Ext. Events`	For an insulation failure, the red ***Earth Fault*** LED is solid. The feed to the grid is stopped.

Table 12.3.: Display of message categories on the LEDs and display

Meaning of LED symbols in the overview table.

LED symbol	Meaning
	LED stays on.
	LED flashes.
	LED is off.

EN

12.2 Analyzing Failures

When a warning is given or a failure shown by the LEDs and the **411 Current Overview** menu, additional information can be displayed.

This is generally divided into two categories:

- External events (incl. insulation and grounding failures)
- Internal events

The additional information on the failures are logged in two separate menus:

- External events: Menu **480 Ext. Events**
- Internal events: Menu **620 Internal Log**

Depending on the failure category, you will automatically be taken by the system from the **411 Current Overview** menu to the appropriate menu with the description of the failure.

The method for resolving the failure depends on the failure category.

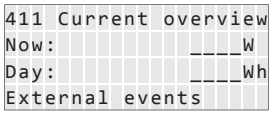
Events in the "external events" failure category are generally resolved by the installer.

Events in the "internal events" failure category must always be discussed with Delta Solar Support first before attempting to resolve the failure.

If events from both categories occur simultaneously, those in the "internal events" category take priority. In this instance, therefore, Delta Solar Support should always be contacted first.

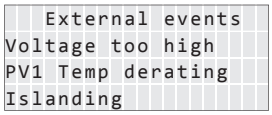
12.2.1 Procedure for External Events

1. Switch to menu **411 Current Overview**.



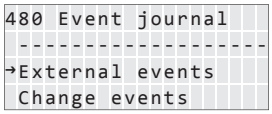
2. In the **411 Current Overview** menu, press the ↵ button.
   → This displays a list of the most recent failures.

The message `Ext. events` is shown in the **411 Current Overview** menu.

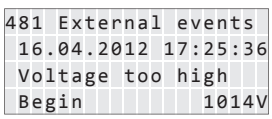


3. You can view the whole list by pressing the ↓ ↑ buttons.

   Press the ↵ button.
   → This displays the **480 Event Journal** menu.



4. Press the ↵ button.
   → The **481 External Events** menu is displayed.

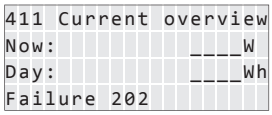


5. You can view the whole list by pressing the ↓ ↑ buttons.
   → Additional information is also shown for each failure.

For the displayed failure text (in this example `Voltage too high`), a description of resolving the failure can be found in this manual under Chapter “12.3 Overview of Failure Messages/ Troubleshooting”, p. 80.

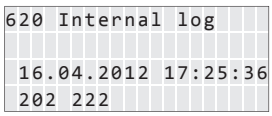
12.2.2 Procedure for Internal Events

1. Switch to menu **411 Current Overview**.



2. In the **411 Current Overview** menu, press the ↵ button.
   → This displays the **620 Internal Log** menu.

The message is displayed in the **411 Current Overview** menu as "Warning ###" or "Failure ###".



3. You can view the whole list by pressing the ↓ ↑ buttons.

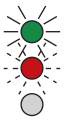
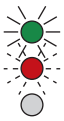
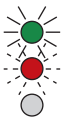
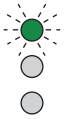
If multiple failures occur, multiple failure numbers are displayed.

4. Contact Delta Solar Support and provide the displayed failure numbers.

NOTE: For internal events, always contact Delta Solar Support **before** attempting to resolve the failure.

12.3 Overview of Failure Messages/Troubleshooting

LEDs	Display message	Message description Fault correction
	Warning ###	Internal failure ("Warning" + three-digit number) ► Please contact Delta Support.
	Failure ###	Internal failure ("Failure" + three-digit number) ► Please contact Delta Support.
	L1 Voltage failure	AC overvoltage or undervoltage on phase L. ► Check the grid voltage shown on the display (**412 Current Data AC** menu). ► If no voltage is present, check the circuit breaker.
	L1 Frequency error	AC high frequency or low frequency on phase L. ► Check the grid frequency shown on the display (**412 Current Data AC** menu). ► If no voltage is present, check the automatic circuit breaker.
	DC inj. Failure	DC feed-in failure. ► Restart the solar power inverter. Contain your maintenance technician if the failure persists.
	L1 Islanding	Frequency shift failure on phase L. ► Ask your electricity supply company about the actual state of the grid. ► Check the installation. ► Restart the solar power inverter. Contain your maintenance technician if the failure persists.
	PV Power too low	The solar power is too low. Insufficient solar irradiation (dawn/dusk). ► Check the PV cell voltage shown on the display (**416 Current Data PV** menu).
	Auto test failure	Failure during Italian autotest. For Italy only. ► Repeat the autotest.

LEDs	Display message	Message description Fault correction
	PV1 ISO startup warn	The startup insulation is too low. ► Check the insulation resistance at the DC side of the solar modules.
	PV1 ISO running warn	The insulation voltage is too low. ► Check the insulation resistance on the solar modules.
	PV1+ Grounding warn PV1- Grounding warn	DC+/DC- not correctly grounded. ► Check the GND connection. ► Check the insulation resistance of the GND connection. ► Replace the grounding kit if necessary.
	PV1 ISO startup fail	The startup insulation is too low. ► Check the insulation resistance at the DC side of the solar modules.
	PV1 ISO running fail	Operating insulation <150 kΩ. ► Check the insulation resistance at the DC side of the solar modules.
	PV1+ Grounding fail PV1- Grounding fail	DC+/DC- not correctly grounded. ► Check the GND connection.
	PV1 Voltage too low	The DC voltage is too low. ► Check the PV cell voltage shown on the display (**416 Current Data PV** menu).
	L1 power reduction	Power reduction active for L1.
	PV1 PW limit to Pn	Power limiting active for PV1.
	PV1 temp derating	Temperature derating active for PV1. Reduced electricity production. The internal temperature of the solar power inverter is between 55 and 70° C. ► Check the ventilation of the solar power inverter. ► Prevent direct sunlight from reaching the solar power inverter.

Meaning of LED symbols in the overview table.

LED symbol	Meaning
	LED stays on.
	LED flashes.
	LED is off.

12.4 Logging the Messages

All important events and messages are logged in the solar power inverter.

The following logs are created:

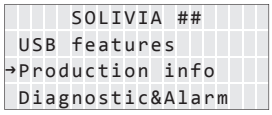
- External events
- Internal events
- Log for VDE AR N 4105
- Change events
- Autotest for Italy

12.4.1 "External events" log

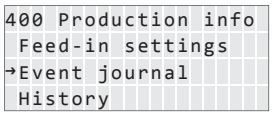
Menu	781 External Events

Description
External events occur outside the solar power inverter and affect its operating behavior.

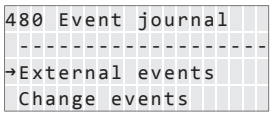
Accessing the Menu
Main Menu > Production Info > Event Journal > External Events



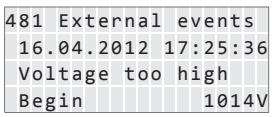
1. In the main menu, press the ↓ ↑ buttons to select ***Production Info*** and then press the ↵ button.



2. Press the ↓ ↑ buttons to select ***Event Journal*** and then press the ↵ button.

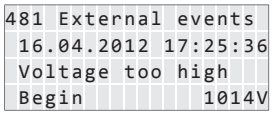


3. Press the ↓ ↑ buttons to select ***External Events*** and then press the ↵ button.



4. You can view the whole list by pressing the ↓ ↑ buttons.

Message Structure
Each message consists of three lines defined as follows:



1. Line	Date and time when the external event occurred.
2. Line	Short description of the failure
3. Line	Additional information, e.g., "Begin" for the occurrence of an event or "End" for the disappearance of an event.

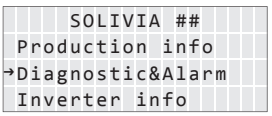
12.4.2 "Internal Events" Log

Menu	620 Internal log

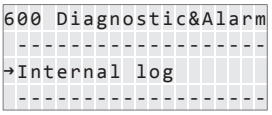
Description
Internal events are problems within the solar power inverter. Internal events should be resolved by Delta Solar Support.

Accessing the Menu

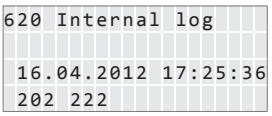
Main menu > Diagnostic&Alarm > Internal Log



1. In the main menu, press the ↓ ↑ buttons to select ***Diagnostic&Alarm*** and then press the ↵ button.

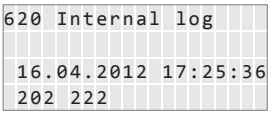


2. Press the ↓ ↑ buttons to select ***Internal Log*** and then press the ↵ button.



3. You can view the whole list by pressing the ↓ ↑ buttons.

Message Structure
Each message consists of two lines defined as follows:



1. Line	Date and time when the internal event occurred.
2. Line	One or more failure numbers

12.4.3 Log for VDE AR N 4105

Menu	640 Report LVD

Description

For grids in accordance with VDE AR N4105, the last five failure messages must be saved in a separate log.

The log is only available for the grids DE LVD and DK LVD.

Accessing the Menu

Main menu > Diagnostic&Alarm > Report LVD

```
    SOLIVIA ##
 Production info
→Diagnostic&Alarm
 Inverter info
```

1. In the main menu, press the ↓ ↑ buttons to select ***Diagnostic&Alarm*** and then press the ↵ button.

```
600 Diagnostic&Alarm
 Internal log
→Report LVD
 --------------------
```

2. Press the ↓ ↑ buttons to select ***Report LVD*** and then press the ↵ button.

```
640 Report LVD
▼▼▼▼▼ ERROR 5 ▼▼▼▼▼▼
16.04.2012 17:25:36
- Critical OverVolt
```

3. You can view the whole list by pressing the ↓ ↑ buttons.

Message Structure

Each message consists of three or more lines defined as follows:

```
640 Report LVD
▼▼▼▼▼ ERROR 5 ▼▼▼▼▼▼
16.04.2012 17:25:36
- Critical OverVolt
```

1. Line	Failure number (the higher the number, the more current the failure)
2. Line	Date and time when the event occurred.
3. and Other Lines	Brief description of the failure(s)

12.4.4 "Change Events" Log

Menu	482 Change events

Description

The log contains a chronological list of all changes to parameters that affect energy production and thereby profit.

Change events can be made on the display, via the service software or by a ripple control signal.

Accessing the Menu

Main Menu > Production Info > Event Journal > Change Events

```
    SOLIVIA ##
 USB features
→Production info
 Diagnostic&Alarm
```

1. In the main menu, press the ↓ ↑ buttons to select ***Production Info*** and then press the ↵ button.

```
400 Production info
 Feed-in settings
→Event journal
 History
```

2. Press the ↓ ↑ buttons to select ***Event Journal*** and then press the ↵ button.

```
480 Event journal
 External events
→Change events
 --------------------
```

3. Press the ↓ ↑ buttons to select ***Change Events*** and then press the ↵ button.

```
482 Change events
16.04.12 17:25:36 S
Max power:      100%
Max power:       90%
```

4. You can view the whole list by pressing the ↓ ↑ buttons.

Message Structure

Each message consists of three lines defined as follows:

```
482 Change events
16.04.12 17:25:36 S
Max power:      100%
Max power:       90%
```

1. Line	Date and time when the external event occurred. Source of the change: D: Display E: External (RS485) U: USB interface S: System
3. Line	Name of the changed parameter and previous value
4. Line	Name of the changed parameter and new value

EN

12.5 Displaying current network settings

Menu	131 View Grid Setup

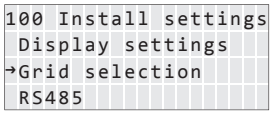
Description

The current grid settings can be displayed using **131 View Grid Setup**. The contents of this menu are write-protected.

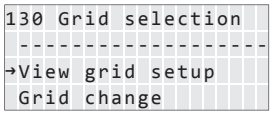
Accessing the Menu

Main menu > Install settings > Grid selection > View grid setup

1. In the main menu, press the ↓ ↑ buttons to select ***Install Settings*** and then press the ↵ button.

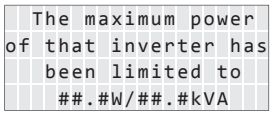


2. Press the ↓ ↑ buttons to select ***Grid Selection*** and then press the ↵ button.

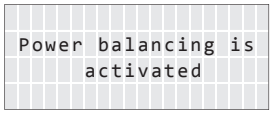


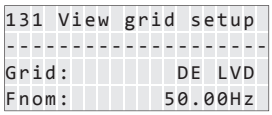
3. Press the ↓ ↑ buttons to select ***View Grid Setup*** and then press the ↵ button.

   → Depending on the current grid settings, different messages may be displayed first.



4. When the messages are displayed, press the ↵ button to confirm each.





5. You can view the whole list by pressing the ↓ ↑ buttons.

12.6 Autotest for Italy

Menu	610 IT Autotest

Description

NOTE

The "Italy Autotest" is only available when the grid has been set to ***IT BT 21***.

In accordance with the CEI 0-21:2012-12 standard, an autotest is required for PV systems equal to or less than 6 kW.

The autotest is performed during commissioning when the grid is set to ***IT BT 21***. The autotest can then be performed at any time.

The Autotest checks the proper operation of the grid and system protection.

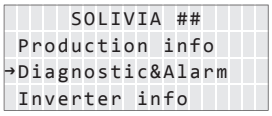
The solar power inverter may only be put into operation when the test result of the last autotest is **Pass**. The reports for the last five autotests are saved.

During the autotest, all parameters required in CEI 0-21 on the AC side of the solar power inverter are tested.

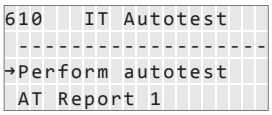
Once the autotest is complete, the result is displayed. The overall result is "Pass" only when all subtests have been passed.

Performing Autotest

Main Menu > Diagnostic&Alarm > IT Autotest > Perform Autotest

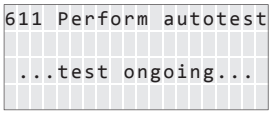


1. In the main menu, press the ↓ ↑ buttons to select ***Diagnostic&Alarm*** and then press the ↵ button.



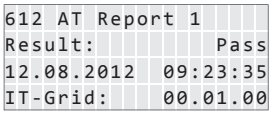
2. Select ***Perform Autotest*** using the ↓ ↑ buttons, then press the ↵ button to perform the autotest.

   → The autotest starts.



3. The Autotest checks the proper operation of the grid and system protection.

   → The test result is displayed after the autotest is completed.



4. You can view the whole list by pressing the ↓ ↑ buttons.

Displaying the test result

The following displays are only examples. The actual test results may differ.

```
612 AT Report 1
Result:          Pass
12.08.2012  09:23:35
IT-Grid:     00.01.00
```

Overvoltage
(Massima tensione 59.S1)

```
612 AT Report 1
L1 OVT:          Pass
Set:      264V<3.000s
Test:     229V 3.000s
```

Overvoltage
(Massima tensione 59.S2)

```
612 AT Report 1
L1 OVT2:         Pass
Set:      252V<0.200s
Test:     228V 0.200s
```

Overvoltage
(Massima tensione 59.S1)

```
612 AT Report 1
L1 UVT:          Pass
Set:      195V<0.400s
Test:     228V 0.400s
```

Undervoltage
(Minima tensione 27.S1)

```
612 AT Report 1
L1 UVT2:         Pass
Set:       92V<0.200s
Test:     230V 0.200s
```

Undervoltage
(Minima tensione 27.S2)

```
612 AT Report 1
L1 HFT:          Pass
Set:  51.50Hz<0.100s
Test: 50.00Hz 0.100s
```

Overvoltage
(Massima frequenza 81>.S2)

```
612 AT Report 1
L1 HFT2:         Pass
Set:  50.50Hz<0.100s
Test: 50.00Hz 0.100s
```

Overvoltage
(Massima frequenza 81>.S1)

```
612 AT Report 1
L1 LFT:          Pass
Set:  47.50Hz<0.100s
Test: 50.00Hz 0.100s
```

Low frequency
(Minima frequenza 81<.S2)

```
612 AT Report 1
L1 LFT2:         Pass
Set:  49.50Hz<0.100s
Test: 49.99Hz 0.100s
```

Low frequency
(Minima frequenza 81<.S1)

Displaying Autotest Reports

The reports from the last five autotests can be shown on the display.

Additionally, the autotest reports can be saved to a USB drive, see „11.8 Creating reports“, p. 75.

Main Menu > Diagnostic&Alarm > IT Autotest > Perform Autotest

```
    SOLIVIA ##
 Production info
→Diagnostic&Alarm
 Inverter info
```

1. In the main menu, press the ↓↑ buttons to select ***Diagnostic&Alarm*** and then press the ↵ button.

```
610   IT Autotest
 Perform autotest
→AT Report 1
 AT Report 2
```

2. Select an autotest report with the ↓↑ buttons, for example, select ***AT Report 1*** and press the ↵ button.

```
612 AT Report 1
Result:          Pass
12.08.2012  09:23:35
IT-Grid:     00.01.00
```

3. You can view the whole list by pressing the ↓↑ buttons.

13. Maintenance and Repair

DANGER

Risk of death by electrocution
Potentially fatal voltage is applied to the solar power inverter during operation. This potentially fatal voltage is still present for five minutes after all power sources have been disconnected.

► Never open the solar power inverter. The solar power inverter contains no components that must be maintained or repaired by the operator or installer. Opening the cover will void the warranty.

14. Decommissioning, Transport, Storage, Disposal

DANGER

Risk of death or serious injury from electrocution

► Disconnect the solar power inverter from power before removing or inserting the AC plug.

DANGER

Risk of death or serious injury from electrocution
Potentially fatal voltage may be applied to the DC connections of the solar power inverter.

► Never disconnect the solar modules when the solar power inverter is under load. First disconnect the solar power inverter from power so it can no longer feed energy. Then open the DC switch.

► Make sure the DC connections cannot be accidentally touched.

WARNING

Risk of injury due to weight
The solar power inverter is very heavy (see “15 Technical data”, p. 87). Improper handling may result in injury.

► The solar power inverter must be lifted and carried by at least two people.

14.1 Decommissioning

1. Disconnect the solar power inverter from power.
2. Open the DC isolating switch.
3. Unplug all cables from the solar power inverter.
4. Unscrew the solar power inverter from the wall bracket.
5. Lift the solar power inverter off of the wall bracket.

14.2 Packaging

Use the original packaging or packaging of the same quality.

14.3 Transport

Always transport the solar power inverter in the original packaging or packaging of the same quality.

14.4 Storage

Always store the solar power inverter in the original packaging or packaging of the same quality. Observe the specifications relating to storage conditions described in Chapter “15 Technical data”, p. 87.

14.5 Disposal

Dispose of the solar power inverter in an appropriate manner according to the legal requirements of your country.

15. Technical data

Input (DC)	SOLIVIA 2.0	SOLIVIA 2.5	SOLIVIA 3.0	SOLIVIA 3.3	SOLIVIA 3.6	SOLIVIA 5.0
Maximum recommended PV power	2400 W_P	3030 W_P	3700 W_P	4000 W_P	4300 W_P	6000 W_P
Rated power	2200 W	2750 W	3300 W	3600 W	3850 W	5500 W_P
Maximum input voltage	125 ... 600 V					
MPP working range	150 ... 480 V				170 ... 480 V	150 ... 480 V
Rated current	6.2 A @ 360 V	7.2 A @ 360 V	9.2 A @ 360 V	10.0 A @ 360 V	10.7 A @ 360 V	15.7 A @ 350 V
Maximum operating current	15.0 A	18.2 A	22.0 A	24.0 A	24.0 A	36.6 A
Overvoltage category	III					

Output (AC)	SOLIVIA 2.0	SOLIVIA 2.5	SOLIVIA 3.0	SOLIVIA 3.3	SOLIVIA 3.6	SOLIVIA 5.0
Rated apparent power [1]	2000 VA	2500 VA	3000 VA	3300 VA	3600 VA	5000 VA
Rated voltage range [2]	184 ... 276 V					
Rated current	8.7 A	10.9 A	13.1 A	14.4 A	15.7 A	22.0 A
Maximum current	10.7 A	15.5 A	15.5 A	15.5 A	16.0 A	27.2 A
Rated frequency	50 Hz					
Frequency range [2]	45 ... 65 Hz					
Power factor (cos φ) [3]	> 0.99 at rated apparent power					
Total harmonic distortion (THD)	< 3% at rated apparent power					
Nighttime consumption	< 2.0 W					
Typical leakage current	<3.5 mA					
Overvoltage category	III					

[1] At cos φ = 1 (VA = W)
[2] Rated voltage range and frequency range are set according to the particular country requirements.
[3] Cos φ = 0.8 capacitive ... 0.8 inductive; full active power fed until cos φ = 0.9 (for SOLIVIA 2.5 - 3.6)/cos φ = 0.95 (for SOLIVIA 5.0).

Safety and Standards	
Degree of protection	IP65
Protection rating	I
Soiling category	III
Configurable switch-off parameters	Yes
Insulation monitoring	Yes
Overload behavior	Current limiting, power limiting
ENS/grid connection guidelines	DIN VDE 0126-1-1; France/islands (60 Hz); RD 661/2007; RD 1699/2011; CEI0-212012-06; Synergrid C10/11 (July 2012); EN 50438; G83/1-2; G59/1-2; VDE-AR-N 4105
EMV	EN61000-6-2; EN61000-6-3; EN61000-3-2; EN61000-3-3
Safety	IEC62109-1/-2

Mechanical Specifications	SOLIVIA 2.0	SOLIVIA 2.5 / 3.0 / 3.3 / 3.6	SOLIVIA 5.0
Dimensions (L x W x D)	418 x 410 x 182 mm	418 x 410 x 182 mm	512 x 410 x 182 mm
Weight	21.5 kg	21.5 kg	31 kg
Cooling	Convection	Convection	Convection
AC Connection	Wieland RST25i3S	Wieland RST25i3S	Wieland RST25i3S
DC connection	1 pair multi-contact MC4	2 pair multi-contact MC4	2 pair multi-contact MC4
Communication interfaces	2x RJ45/RS485 + 1x USB A	2x RJ45/RS485 + 1x USB A	2x RJ45/RS485 + 1x USB A
DC Isolating Switch	Integrated	Integrated	Integrated
Display	3 LEDs, 4-line LCD	3 LEDs, 4-line LCD	3 LEDs, 4-line LCD

15. Technical data

General Specifications	SOLIVIA 2.0	SOLIVIA 2.5	SOLIVIA 3.0
Model name	SOL2.0-1TR1-G4	SOL2.5-1TR1-G4	SOL3.0-1TR1-G4
Delta part number	EOE45010549	EOE45010550	EOE46010551
Max. efficiency	95.8%	96.1%	96.1%
EU efficiency	93.1%	94.3%	94.6%
Max. operating temperature range	-25 ... 70 °C		
Operating temperature at full power without throttling	-25 ... +55 °C		
Storage temperature range	-25 ... 80 °C		
Humidity	0 ... 95%		
Max. operating height	2,000 m above sea level		

General Specifications	SOLIVIA 3.3	SOLIVIA 3.6	SOLIVIA 5.0
Model name	SOL3.3-1TR1-G4	SOL3.6-1TR1-G4	SOL5.0-1TR1-G4
Delta part number	EOE46010552	EOE46010553	EOE46010554
Max. efficiency	96.0%	96.0%	96.0%
EU efficiency	94.7%	94.6%	94.7%
Max. operating temperature range	-25 ... 70 °C		
Operating temperature at full power without throttling	-25 ... +55 °C		
Storage temperature range	-25 ... 80 °C		
Humidity	0 ... 95%		
Max. operating height	2,000 m above sea level		

16. Appendix

16.1 Order numbers

Grounding kit

The ground connection must be installed near the solar power inverter. We recommend using the "Grounding Kit MC4" from Delta.

Grounding kit	Delta Part Number
Grounding Kit MC4	EOE990000275

Cable couplings

Cable coupling types for the DC connections to the inverter. The DC+ connection of the solar power inverter is a plug, the DC– connection is a socket.

DC connection on solar power inverter	Cable coupling type	Wire Cross-Section		Cable sheath diameter	Order number
		mm²	AWG	mm	
DC+ (plug)	Socket	1.5 / 2.5	14	3–6	32.0010P0001-UR
				5.5–9	32.0012P0001-UR
		4 / 6	10	3–6	32.0014P0001-UR
				5.5–9	32.0016P0001-UR
DC- (socket)	Plug	1.5 / 2.5	14	3–6	32.0011P0001-UR
				5.5–9	32.0013P0001-UR
		4 / 6	10	3–6	32.0015P0001-UR
				5.5–9	32.0017P0001-UR

Multi-Contact UTE Kit

The Multi-Contact UTE Kit is designed to conform to the latest French standard UTE C 15-712-1. The UTE kit contains 8 DC measuring elements, a mounting tool and an additional signaling sticker. The UTE kit allows you to conform to the DC protection and signal requirements specified in UTE C 15-712-1.

Multi-Contact UTE Kit	Delta Part Number
Multi-contact UTE kit for SOLIVIA EU Solar Inverter	EOE90000341

RS485 cable

RS485 connection cable	Delta Part Number
Cable for connecting solar power inverters	
Push/Pull cable from Harting, IP67, one side with a blue cable manager, the other side with a white cable manager	
1.5 m	3081186300
3.0 m	3081186500
5.0 m	3081186600
10.0 m	3081186200
20.0 m	3081186400
Connecting cable from the last solar power inverter to a monitoring gateway device, e.g. Solivia Basic Gateway, Solarlog or Meteocontrol WEB'logger	
Outdoor cable, IP65, with Harting RJ45 PushPull and RJ12 plugs	Contact Delta support
Termination resistor for RS485	3072438891

If you wish to assemble cables yourself in order to connect inverters to each other, then you must use cable managers from Harting (IP67 PushPull system cable RJ45).

We recommend using a blue cable manager on one side and a white cable manager on the other side.

Cable manager	Harting Part No.
RJI IP67 data plug Push Pull 8-pin white	09 45 145 1500
RJI IP67 data plug Push Pull 8-pin blue	09 45 145 1510

HARTING Deutschland GmbH & Co. KG (PF 2451, D-32381 Minden, www.harting.com)

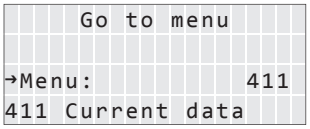
16.2 Overview of menu structure

NOTE

You can use the "Go to Menu" function to directly navigate to a particular menu.

1. To open the **Go to Menu** function, press the ESC button for at least three seconds.

   → **Go to menu** opens.



2. Press the ↵ button to enter the menu number.

   → The first digit flashes.

3. Use the ↓ ↑ buttons to enter the first digit of the menu number and then press the ↵ button.

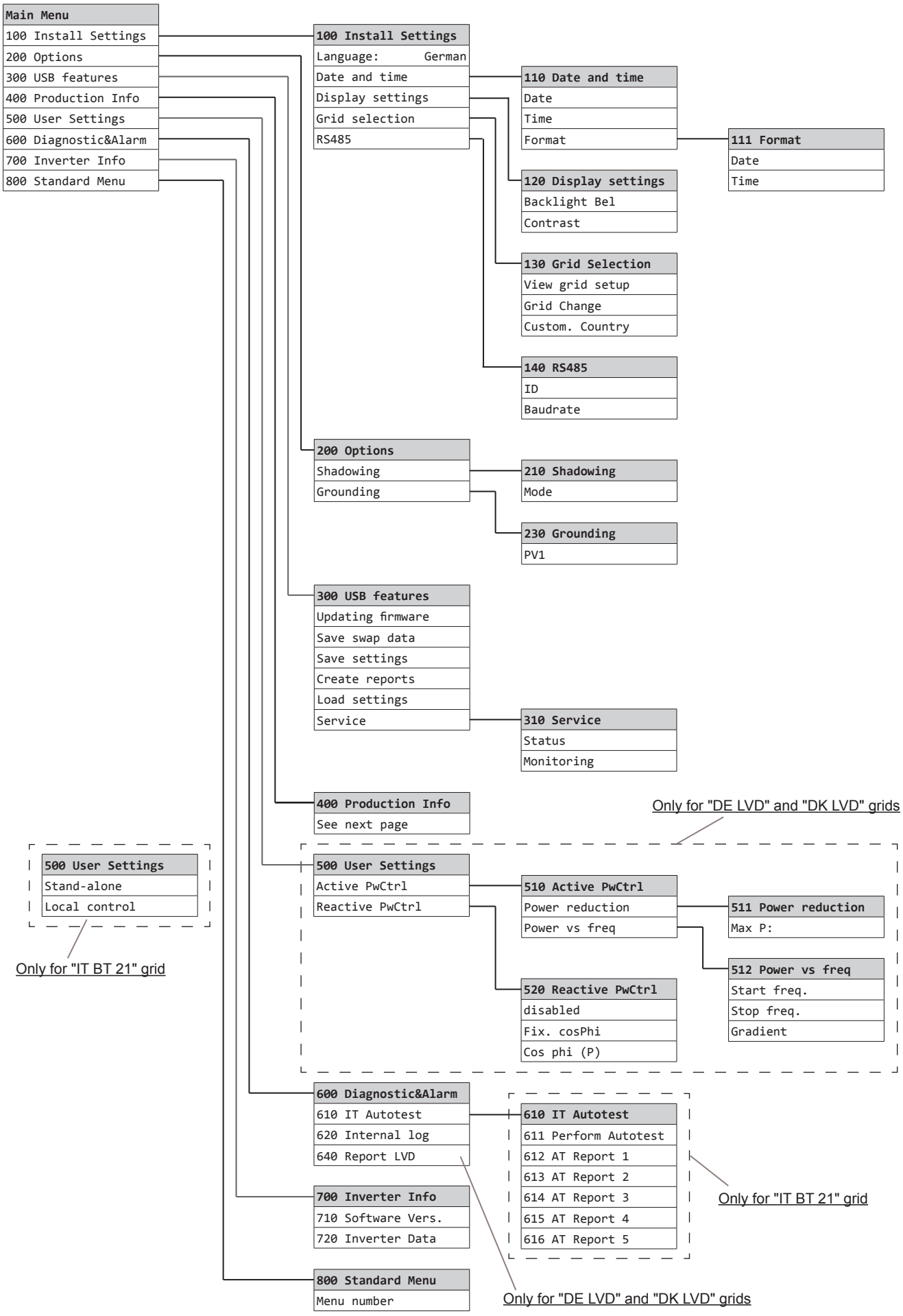
   → The second digit flashes.

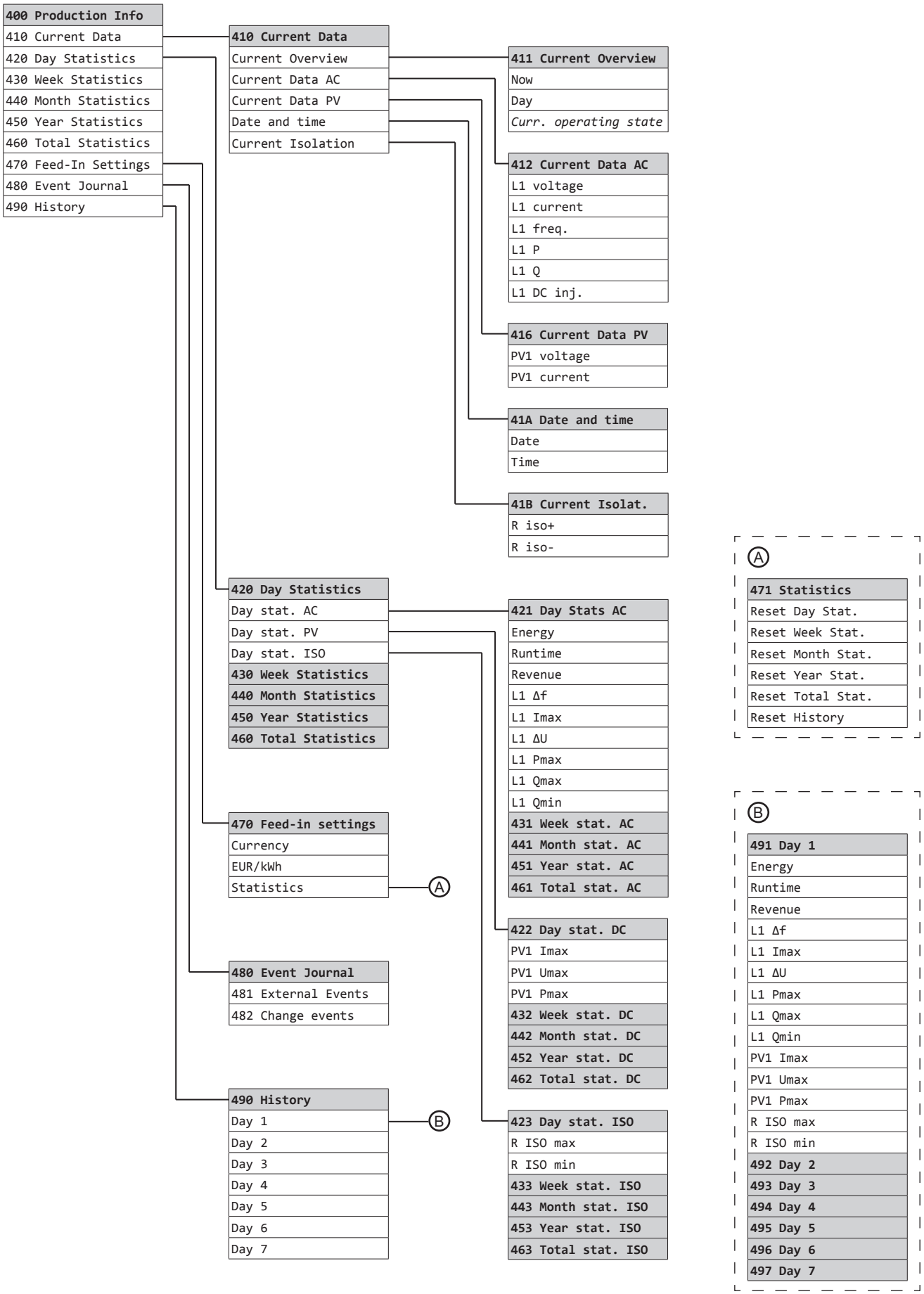
4. The second and third digits are entered in the same manner.

5. Press the ↵ button to complete.

   → The menu corresponding to the entered menu number is displayed.

EN


Main Menu
100 Install Settings
200 Options
300 USB features
400 Production Info
500 User Settings
600 Diagnostic&Alarm
700 Inverter Info
800 Standard Menu
100 Install Settings
Language: German
Date and time
Display settings
Grid selection
RS485
110 Date and time
Date
Time
Format
111 Format
Date
Time
120 Display settings
Backlight Bel
Contrast
130 Grid Selection
View grid setup
Grid Change
Custom. Country
140 RS485
ID
Baudrate
200 Options
Shadowing
Grounding
210 Shadowing
Mode
230 Grounding
PV1
300 USB features
Updating firmware
Save swap data
Save settings
Create reports
Load settings
Service
310 Service
Status
Monitoring
400 Production Info
See next page
Only for "DE LVD" and "DK LVD" grids
500 User Settings
Stand-alone
Local control
Only for "IT BT 21" grid
500 User Settings
Active PwCtrl
Reactive PwCtrl
510 Active PwCtrl
Power reduction
Power vs freq
511 Power reduction
Max P:
512 Power vs freq
Start freq.
Stop freq.
Gradient
520 Reactive PwCtrl
disabled
Fix. cosPhi
Cos phi (P)
600 Diagnostic&Alarm
610 IT Autotest
620 Internal log
640 Report LVD
610 IT Autotest
611 Perform Autotest
612 AT Report 1
613 AT Report 2
614 AT Report 3
615 AT Report 4
616 AT Report 5
Only for "IT BT 21" grid
700 Inverter Info
710 Software Vers.
720 Inverter Data
800 Standard Menu
Menu number
Only for "DE LVD" and "DK LVD" grids


400 Production Info
410 Current Data
420 Day Statistics
430 Week Statistics
440 Month Statistics
450 Year Statistics
460 Total Statistics
470 Feed-In Settings
480 Event Journal
490 History
410 Current Data
Current Overview
Current Data AC
Current Data PV
Date and time
Current Isolation
411 Current Overview
Now
Day
Curr. operating state
412 Current Data AC
L1 voltage
L1 current
L1 freq.
L1 P
L1 Q
L1 DC inj.
416 Current Data PV
PV1 voltage
PV1 current
41A Date and time
Date
Time
41B Current Isolat.
R iso+
R iso-
420 Day Statistics
Day stat. AC
Day stat. PV
Day stat. ISO
430 Week Statistics
440 Month Statistics
450 Year Statistics
460 Total Statistics
421 Day Stats AC
Energy
Runtime
Revenue
L1 Δf
L1 Imax
L1 ΔU
L1 Pmax
L1 Qmax
L1 Qmin
431 Week stat. AC
441 Month stat. AC
451 Year stat. AC
461 Total stat. AC
422 Day stat. DC
PV1 Imax
PV1 Umax
PV1 Pmax
432 Week stat. DC
442 Month stat. DC
452 Year stat. DC
462 Total stat. DC
423 Day stat. ISO
R ISO max
R ISO min
433 Week stat. ISO
443 Month stat. ISO
453 Year stat. ISO
463 Total stat. ISO
470 Feed-in settings
Currency
EUR/kWh
Statistics
A
480 Event Journal
481 External Events
482 Change events
490 History
Day 1
Day 2
Day 3
Day 4
Day 5
Day 6
Day 7
B
A
471 Statistics
Reset Day Stat.
Reset Week Stat.
Reset Month Stat.
Reset Year Stat.
Reset Total Stat.
Reset History
B
491 Day 1
Energy
Runtime
Revenue
L1 Δf
L1 Imax
L1 ΔU
L1 Pmax
L1 Qmax
L1 Qmin
PV1 Imax
PV1 Umax
PV1 Pmax
R ISO max
R ISO min
492 Day 2
493 Day 3
494 Day 4
495 Day 5
496 Day 6
497 Day 7

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22.07.2013 - All information and specifications are subject to change without prior notice